

Mining

CONGRESS JOURNAL



APRIL
1956

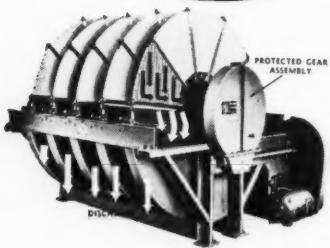


1956
Coal Convention
Cincinnati, Ohio, May 7-9

See Pages 48-58

DENVER CAN SUPPLY COMPLETE EQUIPMENT FOR YOUR MILL.

Crushers, Screens, Feeders, Ball-Rod Mills, Classifiers, Jigs, Pumps, Samplers, Agitators, Conditioners, Flotation, Thickeners, Filters, Dryers, Ore Testing and Mill Design Services.



DENVER DISC FILTERS Give You These Advantages—

- DRIER FILTER CAKE, with positive gravity drainage of filtrate before blow-off.
- LOWER MAINTENANCE COST—all wearing parts are designed for long life.
- LARGER FILTER AREA per unit of floor space.
- WIDE OPERATING FLEXIBILITY—Two or more products can be filtered at the same time.
- Available in sizes from 2'-1 disc to 9'-12 disc.
- Drum Filters also available.

WRITE FOR BULLETIN NO. FG-B1.

DENVER SPIRAL RAKE THICKENERS ... Low Cost, Continuous, Heavy Duty Service

1. CONTINUOUS OPERATION

Patented 30° spiral rakes move coarse and fine settled solids uniformly to center discharge with continuous motion in one revolution. This action not only minimizes the chance of choke-ups in the tank, but assures continuous operation at maximum tonnage and provides greater sand raking capacity.

2. SANDING-IN OF RAKES PREVENTED

The driving mechanism has a sturdy worm gear unit with an integral lifting device. The lifting device can be manual or motorized and if desired, can be equipped with automatic features to prevent sanding-in of rakes on shutdown or damage by overload.

3. A THICKENER FOR EVERY PURPOSE

Tanks can be wood, steel, concrete or rubber covered. Rakes and shafts can be carbon steel, stainless steel or wood, also lead or rubber covering can be supplied depending upon the kind of material to be handled. Sizes up to 80' dia. x 12' deep.

For complete information, WRITE FOR BULLETIN NO. T5-B5.

"The firm that makes its friends happier, healthier and wealthier"



DENVER EQUIPMENT CO.

1400 Seventeenth St. • Denver 17, Colorado
DENVER • NEW YORK • CHICAGO • VANCOUVER • TORONTO
MEXICO, D. F. • LONDON • JOHANNESBURG

Auger mines 700 tons of coal per shift with TIMKEN® bearings taking the thrust loads

THIS Compton Auger, manufactured by Compton, Inc., Clarksburg, West Virginia, actually pulls coal out from underneath overburden and loads it on a truck at the rate of three tons a minute. Even with necessary auger shaft changes it mines 700 tons of coal per normal shift with a maximum four-man crew.

A 300-hp engine forces the auger into the seam. The tremendous resulting thrust load is carried by Timken® tapered roller bearings on the auger shaft. On top of this, the Timken bearings support the heavy weight of the

shaft itself. Being tapered, Timken bearings take both radial and thrust loads.

Shock loads aren't a problem either. Timken bearings are case-hardened to give them hard, wear-resistant surfaces over tough, shock-resistant cores. And full line contact between their rollers and races gives Timken bearings load-carrying capacity to spare.

Wear is held to a minimum because Timken bearings practically eliminate friction. They're designed to roll true and are precision manufactured to live up to their design. We even

make our own steel to control quality all the way. We're America's only bearing Manufacturer that does.

To get these advantages in the equipment you build or buy, always specify bearings with the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



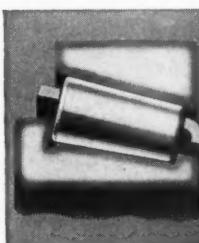
This symbol on a product means
its bearings are the best.



COMPTON, INC. mounts the shafts of its auger on Timken bearings to assure minimum maintenance, trouble-free performance and long life despite extra tough loads.



TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. Timken fine alloy steels.

NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION



NOW...THE JEFFREY SHUTTLE CAR

Check these TOP-VALUE features
of the Jeffrey Class 90 Shuttle Car!

✓ LOADS RAPIDLY

Those big loads that pay off at the tipple can be loaded fast on the "90". Conveyor operating speed is 50 feet per minute. Chains and flights are the same as used in heavier duty shuttle cars . . . hold up longer. They are the highest quality, produced in Jeffrey's own chain shop. End of car is especially designed to fit easily under booms on loaders or surge cars, for maximum production coordination between face units and main transportation.

✓ CARRIES HEAVY LOADS

Up to 8 tons can be loaded on this sturdy car. No need to worry about overloading. The "90" has the axles and wheel units originally calculated for much heavier duty on the field-proven heavy-duty Class 67 car. You have this extra capacity for all loads—coal or rock.

✓ MAKES MORE ROUND TRIPS

Even when fully loaded, the "90" trams at an average of more than 4 MPH. Two powerful Jeffrey 10 HP motors operate through four-wheel drive for maximum traction and speedy trammimg. Has progressive series-parallel traction control with hand-selective series position.

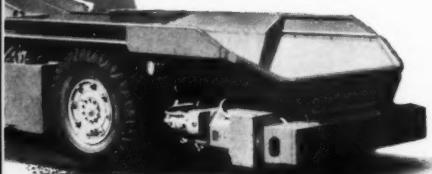
✓ DISCHARGES QUICKLY

Less than one minute is required to completely unload the "90". Variable speed hydraulic drive on the discharge conveyor facilitates unloading to belt conveyors or mine cars at a uniform rate—in the least time, with a minimum of spillage. Hydraulic elevating discharge conveyor is standard and available in lengths of 45", 52" or 57". Jammed lumps are never a problem, can be cleared instantly by reversing conveyor.

✓ OPERATES EASILY

Operators everywhere are enthusiastic about the maneuverability of Jeffrey shuttle cars. The drive is positive—employs a no-slip differential between wheels on the same axle. Steering is exceptionally easy. Four-wheel power steering and four-wheel disc-type hydraulic brakes, plus conveniently placed steering and brake controls, minimize operator fatigue and help boost tonnage.

INQUIRE TODAY
ABOUT THIS
IMPRESSIVE VALUE



CLASS 90



TOP VALUE FOR...

- Heavy duty service
- Low first cost
- Low operating cost

Here is Jeffrey's latest contribution to the shuttle car field . . . the low-cost heavy-duty Class 90 unit!

The Jeffrey Class 90 car provides all the essential features of the Class 67 Car . . . the industry's leader for *big payloads, speedy tramping and easy maneuverability* . . . features that mean *low operating cost*.

Before you buy *any* shuttle car, it will pay you to investigate this important Jeffrey value! Call our nearest office.

THE
JEFFREY MANUFACTURING COMPANY
COLUMBUS 16, OHIO

The Class 90 shuttle car is available in 44" and 50" basic heights, with 4", 6" or 8" sideboards. Payload of 8 tons can be trammed at more than 4 MPH average. Powered by two 10 HP traction motors. Sturdy frame and body. Heavy duty wheel units and large diameter tires.



JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Now ready for installation!

Comparison of U. S. Fire-Resistant MineHaul Belts with standards as set forth in United States Bureau of Mines Schedule 28*

	0	1	2	3
After-Flame Test				
U. S. B. M. Standard	██████████	██████████	██████████	██████████
U. S. Fire-Resistant MineHaul Belts				
4-ply, 42 oz.	██████████	██████████	██████████	██████████
4-ply Style EN	██████████	██████████	██████████	██████████
4-ply Style XN	██████████	██████████	██████████	██████████
After-Glow Test				
U. S. B. M. standard	██████████	██████████	██████████	██████████
U. S. Fire-Resistant MineHaul Belts				
4-ply, 42 oz.	██████████	██████████	██████████	██████████
4-ply Style EN	██████████	██████████	██████████	██████████
4-ply Style XN	██████████	██████████	██████████	██████████

*as tested in United States Rubber Company laboratories in accordance with Bureau of Mines test specifications.



U. S. Fire-Resistant MineHaul Belts

U. S. Rubber's *Fire-Resistant* MineHaul Belts have already been given the United States Bureau of Mines' acceptance designation: "Fire Resistant, U.S.B.M. No. 28-5."

These belts are the result of an extensive development program carried on by U. S. Rubber to provide the mine operator with underground conveyor belts that offer *maximum* fire resistance. In fact, the new U. S. *Fire-Resistant* MineHaul Belts EXCEED the Bureau of Mines specifications, as the chart above shows.

And, naturally, these new belts have all the added features built into all "U. S." conveyor belts: optimum toughness, high impact resistance, outstanding rip resistance, excellent fastener holding ability, added edge protection—to name a few.

Contact any of the 27 strategically located "U. S." District Sales Offices or write us at Rockefeller Center, New York 20, N. Y.

See us at the
American Mining Congress,
Netherlands Plaza Hotel,
Cincinnati, Ohio
May 7-9

Mechanical Goods Division

United States Rubber



APRIL, 1956

VOLUME 42 • NUMBER 4

Mining

CONGRESS JOURNAL

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■ FRONT COVER: Loading coal behind a continuous mining machine at Gorgas, Ala.

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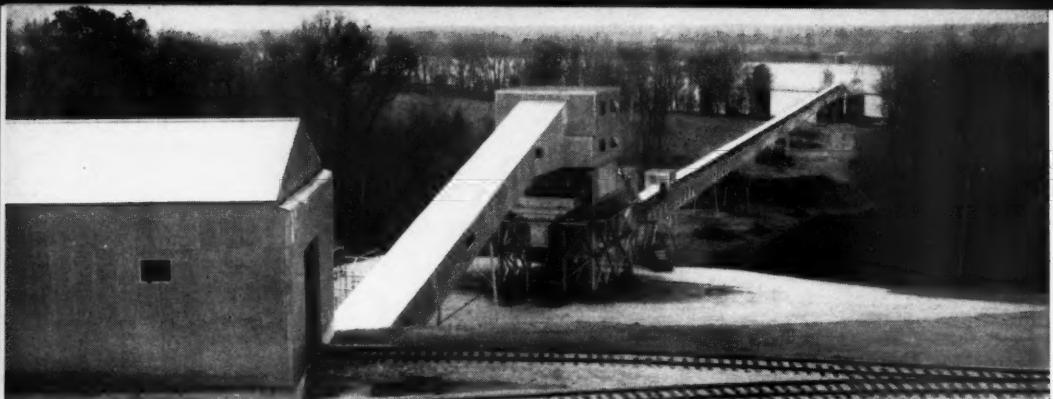
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Only 9 men per shift are needed to operate \$1,300,000 Yankeetown Dock Corporation installation. F-M Diesel Engine, Caterpillar switch

engine, car tipper, breaker plant, 115 coal cars, gob truck and conveyor are lubricated with STANOLITH Grease MP.

This "3 in 1" Indiana coal mining group chooses STANDARD

Elva Nordhorn (right), assistant superintendent, Yankeetown Dock Corporation and Standard Oil industrial lubrication specialist Bill Griswold inspect car tipper. Bill Griswold is one of two experienced lubrication specialists in Standard's Evansville office who provide technical service. Bill is well qualified for the job. He has 30 years with Standard.



This 4 foot wide conveyor belt transports coal 1,105 feet from breaker plant to Ohio River loading dock. Loaded barges move up river to Clifty Creek power plant at Madison, Indiana. Conveyor system is lubricated with STANOLITH Grease MP. Conveyor operates two shifts per day the year 'round.

Two Indiana mines and their processing-shipping unit use STANDARD lubricating oils, fuels and greases; get three-way benefit.

Victoria and Wright Mines and Yankeetown Dock Corporation, in Southern Indiana, comprise one of the world's top-flight coal producing operations. This mining group delivers a million tons of coal a year to Clifty Creek power plant near Madison, Indiana. The power plant, in turn, produces electric power for an atomic energy installation nearby.

Both of the mines and the service facility depend upon Standard Oil Company for fuels, lubricating oils and greases. Across the page are three reasons why:



1. Standard's experienced mine lubrication technical service.

Cn-the-spot lubrication technical service is provided the mines and dock by two experienced men from Standard's Evansville office. These industrial lubrication specialists know mine lubrication. They are backed up by technical help from the Standard Oil headquarters office and laboratories. Headquarters for the mines and dock are in Chicago, Kansas City, St. Louis and Indianapolis. Standard Oil has offices in these cities with industrial lubrication men on hand to give assistance whenever needed. Mine and dock operations thus receive complete lubrication technical service support.

2. Standard's high quality and complete line of fuels, lubricants and greases.

Lubricants and fuels that keep equipment in service and minimize maintenance, contribute much to making this—or any—installation a profitable operation. The quality lubricants and fuels the mines and dock unit buy from Standard deliver top performance day after day, rain or shine, hot or cold, spring, summer, fall, winter.

3. Standard's fast delivery and dependable service.

Warehouse facilities in Boonville, less than 5 miles away, serve the mines and dock. Stocks of recommended lubricants warehoused there, back up inventories at the site. Stock control holds requirements to necessary levels. Fast delivery from refinery assures an uninterrupted flow of required oils, fuels, greases; provides the mines and dock with the third big reason for buying from Standard.

Could your mine profit from services such as these provided by Standard Oil? Perhaps Standard fuels and lubricants could give a new look to your operations. Find out. Call your nearby Standard Oil industrial lubrication specialist. There is one near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Marian 5561 stripper removes overburden, Marian 151M loading shovel loads coal haulers at Victoria Mine. Two mines and dock operate as one integrated unit. Facility is one of the world's largest, most modern coal mining and handling systems.



One of Victoria Mine's 25 ton Euclid coal haulers unloads into waiting coal car. Trucks haul coal to railroad spur, railroad transports coal to breaker plant. Whole system uses Standard lubricants and fuels.

At the Wright Mine pit, Marlin Carter (right), foreman, and Standard Oil lubrication specialist Oscar Daussman discuss lubrication. Oscar has been helping customers with lubrication problems all of his 30 years at Standard. Customers look to Standard for this kind of help.



STANDARD OIL COMPANY
(Indiana)

For big-scale performance



on all grading jobs

SEE THE **Forty Five** BEFORE YOU BUY

Here's motor grader design that pays off in extra output on today's tougher, more precise jobs. You get these big advantages when you put the FORTY FIVE to work for you—more power at the wheels, more dirt at the blade, plus precision control and ease of operation.

Allis-Chalmers diesel engine with follow-through combustion provides real lugging ability . . . responds quickly to varying load conditions . . . has the power with tandem drive to pull through soft spots, roll big windrows, peel off that last inch of tough, hard dirt.

ROLL-AWAY moldboard reduces friction drag by rolling the load up and ahead of the blade edge . . . moves more dirt with less effort . . . makes more efficient use of engine power on sloping, rough grading, stripping and other heavy-duty construction and maintenance jobs.

Toggle-type controls give the operator fingertip command of every blade position, every job. Exclusive mechanical toggle-type action provides a positive "feel," yet operation of moldboard components, scarifier and front wheel lean is accurate and easy.

Get a demonstration of the FORTY FIVE from your Allis Chalmers dealer . . . let him show you how fully-enclosed power steering, accelerator-decelerator pedal, "box seat" comfort and visibility, and other features give you an extra measure of performance on all your grading jobs. And check the complete service program he offers you . . . factory-trained servicemen and True Original Parts for high-quality service, continued top performance and long equipment life.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN



ALLIS-CHALMERS

ROLL-AWAY is an ALLIS-CHALMERS trademark

Forty Five

120 brake hp

23,800 lb

6 forward speeds
to 20.6 mph

3 reverse speeds
to 7.0 mph

Summer styles for coal piles...



Your coal needs
the all-weather coat,
Permatreat, for 8 good
year-round reasons.

1. **DUST PROOF—ODORLESS** —Permatreated coal insures dustless delivery and handling, odorless storage and burning. Easier to handle, easier to sell—that's the secret of Permatreated coal for home and industry. More sales because of more sales points to clinch the sale.
2. **MAINTAIN QUALITY** —Permatreat reduces deterioration from weathering.
3. **ELIMINATE WINDAGE LOSS** —that results in lost weight claims and air pollution complaints.
4. **CONTROL BULK DENSITY** —Permatreat insures uniform coke production and quality.
5. **FREEZE PROOF** —Permatreated coal resists freezing and eliminates frozen stock piles.
6. **REDUCE MOISTURE** —Add 300,000 BTU per ton for each 1% reduction in moisture.
7. **DECREASE WATER ABSORPTION** —Permatreated coal repels water and reduces moisture in stock piles.
8. **AVOID CORROSION** —Non-corrosive Permatreat can't pit or corrode stoker equipment.

Coal treated with ...



"lasts the life of the coal"

Interested? Write, wire or phone
ASHLAND OIL & REFINING COMPANY
Ashland, Kentucky

Special Advisory Service available from
nationally recognized authorities on coal treatment.



Carset Jackbits

DRILL FASTER and LAST LONGER



Carsets being used with JR38A Jackdrill.

INGERSOLL-RAND Carset Jackbits, with tungsten carbide cutting edges, have demonstrated cost saving performance on rock drilling jobs all over the world.

Carset Jackbits have *deeper Carbide Inserts* for more footage between grinds—more regrinds per bit. They have *more metal behind the inserts*, providing greater support and longer bit life. *Stronger skirt walls* and *greater bearing area* on the rod shoulders enable the bit body to stand up for the full life of the carbide inserts.

These longer lasting, faster drilling Carset Jackbits, together with Ingersoll-Rand's *complete line* of rock drilling equipment, give you an unbeatable combination for overall drilling efficiency. Your nearest I-R representative will be glad to help you pick the combination best suited to your needs.

Carset Jackbits are available in gauge sizes from $1\frac{1}{4}$ " to $3\frac{1}{2}$ ".

Ingersoll-Rand 15-363

11 Broadway, New York 4, N.Y.

ROCK DRILLS • COMPRESSORS • AIR TOOLS • CENTRIFUGAL PUMPS • TURBO-BLOWERS • CONDENSERS • DIESEL AND GAS ENGINES'

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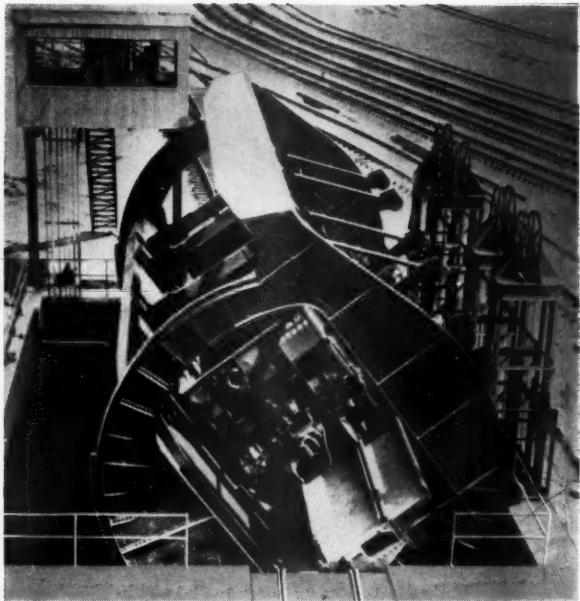
**From Design to
Successful Operation...
You can depend on**

Heyl & Patterson

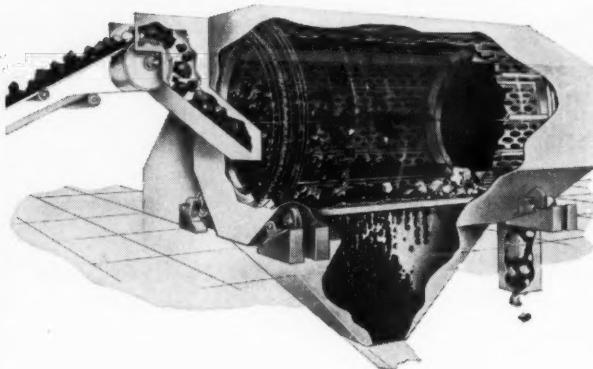
**For Heavy Materials
Handling Equipment**

H & P Rotary Car Dumper

For handling up to 120-Ton Capacity Hoppers or Gondola Cars, these completely automatic one-man operated dumpers can be built in 2, 3 or 4 clamp design. The Automatic Car Clamps may be



operated by mechanism contained on the Dumper itself or by counterweights. Optional features include Car Retarder on platen and platen-mounted scales.



H & P Bradford Coal Breaker

It serves as a preliminary coal cleaner relieving preparation plants or power plants of handling the large impurities in the raw coal. The Breaker shown has Open Ends equipped with steel tires which run on four rollers mounted on axles with anti-friction bearings. It can also be built as a Trunnion type. The Breaker can be of gear-driven design or as shown . . . driven by a motor through a gear reducer and a chain transmission to the periphery of the Breaker.

HEYL & PATTERSON EQUIPMENT FOR THE COAL INDUSTRY

**Bradford Coal Breakers
Car Dumpers: Rotary Railroad
Rotary Mine
Coal Crushers
Conveying Systems**

**Mine Car Handling Equipment
Preparation Plants
Refuse Disposal Cars
Reineveld Centrifugal Dryers**

**Thermal Dryers
Thorsten Sampling Systems
Water Clarification Systems
Wet Cyclones:
Classifiers and Thickeners**

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For a Heyl & Patterson
Engineer To Consult
With Your Engineers

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I N C.
55 FORT PITT BLVD. • PITTSBURGH 22, PA.

**Here's
the drill
you need for**

**LARGER,
LOWER-COST
BLASTHOLES**

*Joy 60-BH Drill in operation in a
large Southwest copper mine.*



the JOY 60-BH Super Heavyweight Champion

For high-production open pit mining of copper, as illustrated above, large-diameter blastholes are a *must*! The way to drill those large-diameter holes economically —either in copper ore, or in any other open-pit mining or overburden removal job—is with the Joy 60-BH Super Heavyweight Champion. Here's why: because this Joy rotary drill excels in all three of the features which determine bit penetration:

ROTATION—Infinite variation of bit speeds, accurately controlled bit speeds, more power on bit rotation, and constant indication of bit speed and pressure by gauges.

BIT WEIGHT—The Joy hydraulic feed, using two 5-foot hydraulic cylinders, is the most efficient and dependable method of applying bit pressure. It is more accurately controlled and less hazardous than other methods.

CUTTINGS REMOVAL—Only Joy uses a heavy-duty, industrial-type, water-cooled air compressor to insure more dependable air supply required for efficient rotary-air blast drilling.

Other features include a self-aligning hydraulic automatic chuck, hydraulically raised and lowered derrick, and rod handling device.

The 60-BH, capable of drilling 9" to 12" diameter holes in even the hardest rock formations, is the largest in the outstanding line of Joy Champion "rotary-air blast" drills. Smaller models are the 58-BH Heavyweight for 7½" diameter holes, and the 56-BH Middleweight for 6¼" diameter holes. Let us quote on your requirements. *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 35-3



Consult a Joy Engineer

For AIR COMPRESSORS, ROCK DRILLS, CORE DRILLS, HOISTS and SLUSHERS, MINE FANS and BLOWERS

JOY

WORLD'S LARGEST BUILDER OF CORE DRILLS, ROTARY BLAST HOLE DRILLS AND MOTORIZED DRILL RIGS

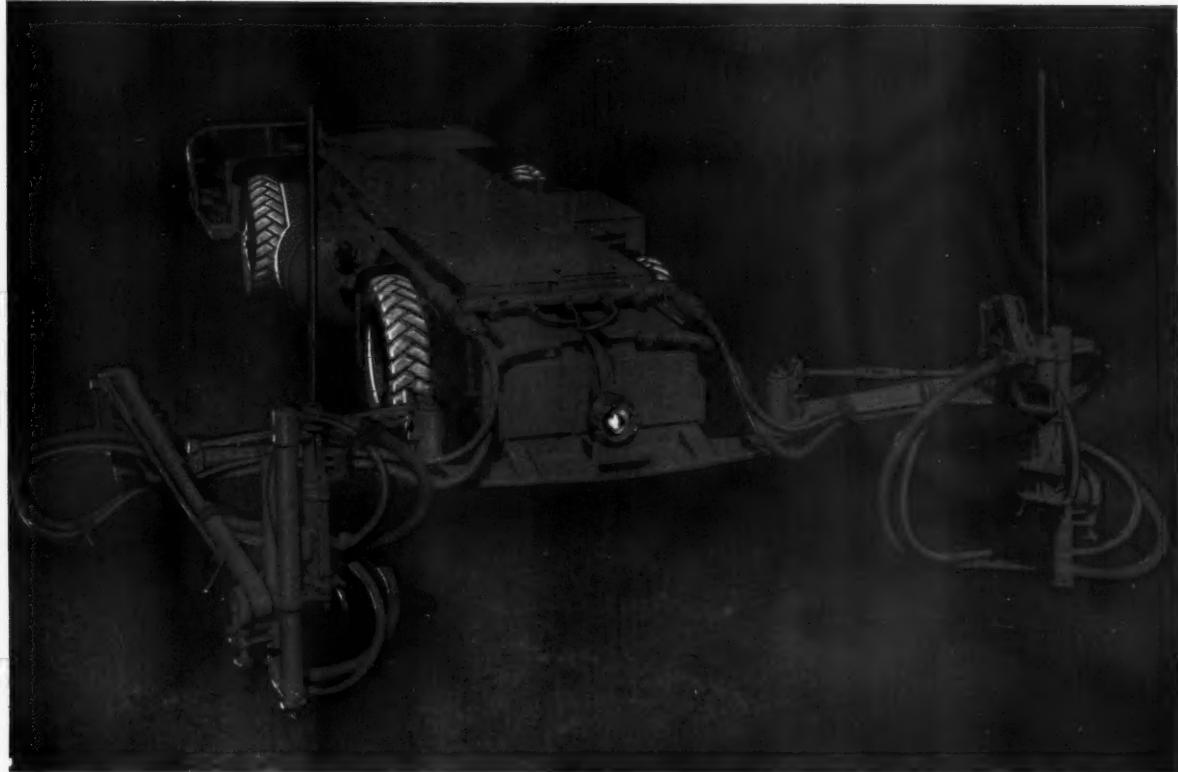


BIGGEST DIGGER ON TWO CRAWLERS

The 10 yard dipper of this big digger is impressive, for the MARION 191-M is the world's largest loading shovel on two crawlers. Equally important on the iron range is the fast, small-machine cycle time that converts mountains into rail car loads in jig time.

MARION POWER SHOVEL COMPANY • MARION, OHIO

Acme adds 275 Compressor to JUMBOLTER...*for fastest most efficient roofbolting*



SUPER JUMBOLTER NOW AVAILABLE IN ONE COMPACT, SELF CONTAINED UNIT

It's Acme's newest contribution to better, faster, safer mining. Super Jumbolter combines all the advantages of the original Jumbolter plus a 2-stage 275 CFM compressor.

New Super Jumbolter saves time and working space. No need for separate portable compressor—no air lines to get in the way—just move your Super Jumbolter in and start bolting.

Jumbolter stopers put in bolts more than three times as fast as ordinary methods. It can work an area 23' 10" wide from one location. Air-articulated arms reach out 9' in front of

machine, swing in a 270° arc. Overall heights from 21" permit bolting any roof from 36" to 9' in height.

The new Jumbolter has a unique built-in dust collection system. It does not remove (or pass) the cuttings through the body of the machine, nor does it use any type of external hood, or dust collection tube. Cuttings are removed through the side of the chuck housing immediately after they leave the drill steel. They are collected from the face through holes in the bit and down through the center of the drill steel.

Write today for new descriptive folder showing the many advantages of Acme's new Super Jumbolter.

ACME Machinery Company

PHONE 2274

WILLIAMSON, WEST VIRGINIA

VICTAULIC®



METHOD OF PIPING

VICTAULIC HAS EVERYTHING...



VICTAULIC COUPLINGS

Simple, fast, reliable. Styles 77, 77-D, for standard uses with steel or spiral pipe, — Style 75 for light duty. Other styles for cast iron, plastic and other pipes. Sizes $\frac{3}{4}$ " to 60".



ROUST-A-BOUT COUPLINGS

For plain or beveled end pipe Style 99. Simple, quick, and strong. Best engineered and most useful plain end coupling made — takes a real "bull-dog" grip on the pipe. Sizes 2" to 8":



VICTAULIC SNAP-JOINTS

The new, boltless, speed coupling, Style 78. Hinged into one assembly for fast piping hook-up or disassembly. Hand locks for savings in time and money. Ideal for portable lines. Sizes 1" to 8".

COUPLINGS FOR EVERY PIPING JOB



VICTAULIC FULL-FLOW FITTINGS

Elbows, Tees, Reducers, Laterals, a complete line—fit all Victaulic Couplings. Easily installed — top efficiency. Sizes $\frac{3}{4}$ " to 12".



VIC-GROOVER TOOLS

Time saving, on-the-job grooving tools. Light weight, easy to handle — operate manually or from any power drive. Sizes $\frac{3}{4}$ " to 8".

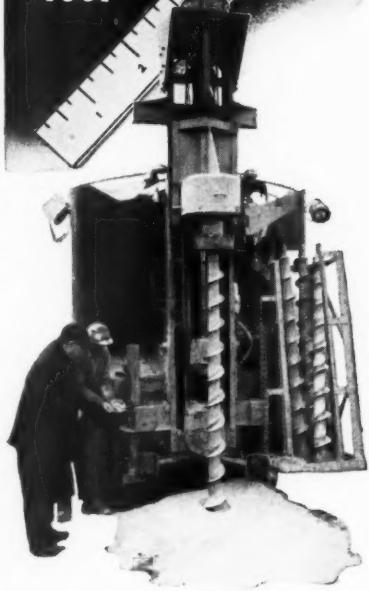
PLUS FITTINGS AND GROOVING TOOLS

"EASIEST WAY TO MAKE ENDS MEET"

Promptly available from distributor stocks coast to coast.
Write for NEW Victaulic Catalog-Manual No. 55

VICTAULIC COMPANY OF AMERICA
P. O. BOX 509 • Elizabeth, N. J.

MEASURE
DRILLING
SAVINGS
by
the
foot*



McCarthy
NEW HEAVY-DUTY
VERTICAL AUGER DRILL

*Strip Miner Drills 8-1/2" Blast Holes 60 Ft.
Deep in 1 Hour, Including Moving Time.

Savings, like costs, are measured by the foot, especially in tough earth and rock formations. Using the new McCarthy 106-24 Vertical Drill, this Pennsylvania strip miner cut drilling time to 1 hr. per hole (including moving time) on 60-ft. blast holes 8½" in diameter. Formation was 20 ft. of soft top strata, 35 ft. sandstone and 5 ft. of hard sandstone and bastard limestone.

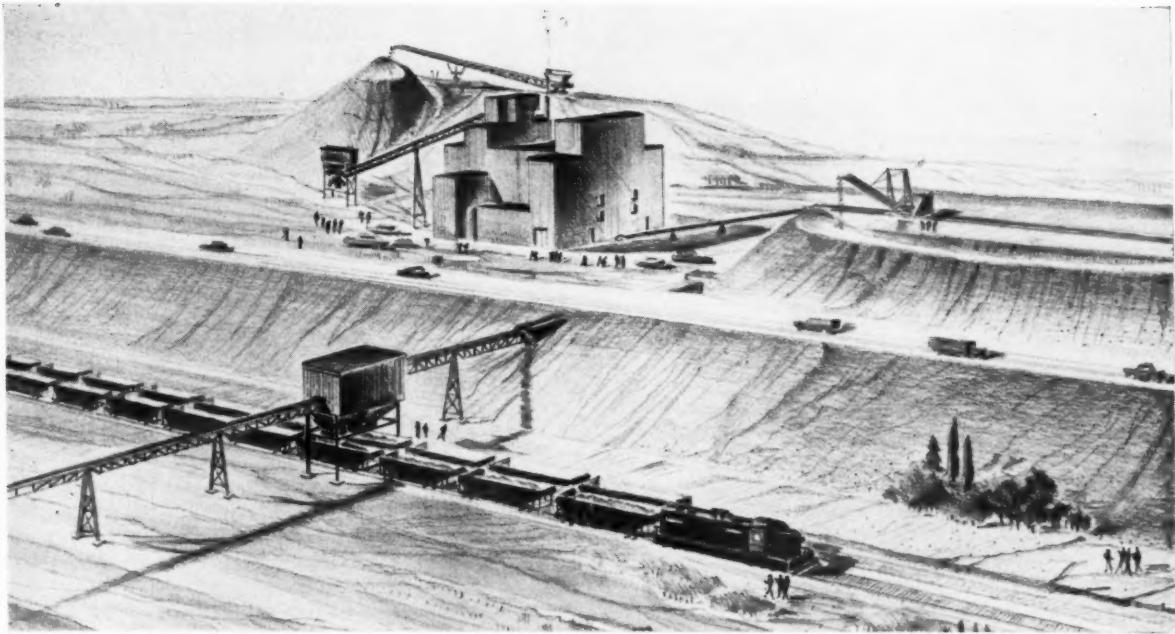
A new speed reducer on Model 106-24 slows auger rotation for drilling harder rock formations. The result is more torque, or "biting power." You have fewer bit failures, cutting over-all drilling time. Driller above used tungsten carbide bits.

The McCarthy Model 106-24—"World's Fastest Heavy-Duty Vertical Auger Drill"—handles cutters from 3" to 24" in diameter.

Write for Bulletin M-100



THE SALEM TOOL CO.
779 S. ELLSWORTH AVE.
SALEM, OHIO • U. S. A.



expanding the West Kentucky coal field--

The new Dekoven Coal Mining Co., Dekoven mine, Dekoven, Ky., will provide a new source of fuel for the growing number of large coal consumers along the waterways of the Mid-West.

For this mine Roberts and Schaefer Company has engineered the preparation plant, designed and equipped to meet the standards required for the new market. Into the preparation plant has gone the skill and experience gained by this organization during more than fifty years of close co-operation with the coal mining industry.

Supplementary equipment includes raw and clean coal storage, and facilities for rail and water shipment.

Roberts and Schaefer experience is not confined to modern cost-saving coal preparation plants alone but includes a wide variety of installations for water supply, sewage treatment and disposal, and many different types of buildings. Consult our experienced engineers, without obligation, on all your requirements.

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You Get "Pay-Off" Performance Every Day with Le Roi-Cleveland Sinkers

...because they have the right force of blow and strong rotation, from proper valve design and port arrangement

That's why Le Roi-Cleveland Sinkers bite into more rock . . . drill more footage per shift. A fast, positive-action end-seating valve, and precise port arrangement, provide powerful force of blow and strong rotation. And this automatic valve meters the air, too. It keeps air consumption down. You get longer life because the performance of this valve is not affected by wear.

Le Roi-Cleveland Sinkers are lubrication-protected. The rifle bar is oiled at every stroke of the

piston. This prolongs rifle nut life by 50 per cent or more. That's one of the reasons why you get "pay-off" performance every day in all conditions. Le Roi-Cleveland Sinkers are at their best when the going is toughest.

There's plenty of hole-cleaning power to aid the powerful force of blow and strong rotation of Le Roi-Cleveland Sinkers. They take a fresh bite of rock with every piston blow.

"Pay-Off" performance is really built into all Le Roi-Cleveland Sinkers. Use them to get peak efficiency every day . . . drill more feet of hole per shift. A complete line of Le Roi-Cleveland Sinkers is available from 18 to 80 lbs. Write today for full information.

RD-77

LE ROI



Division of Westinghouse Air Brake Co.

Milwaukee 1, Wisconsin



PORTABLE AIR COMPRESSORS



TRACTAIR



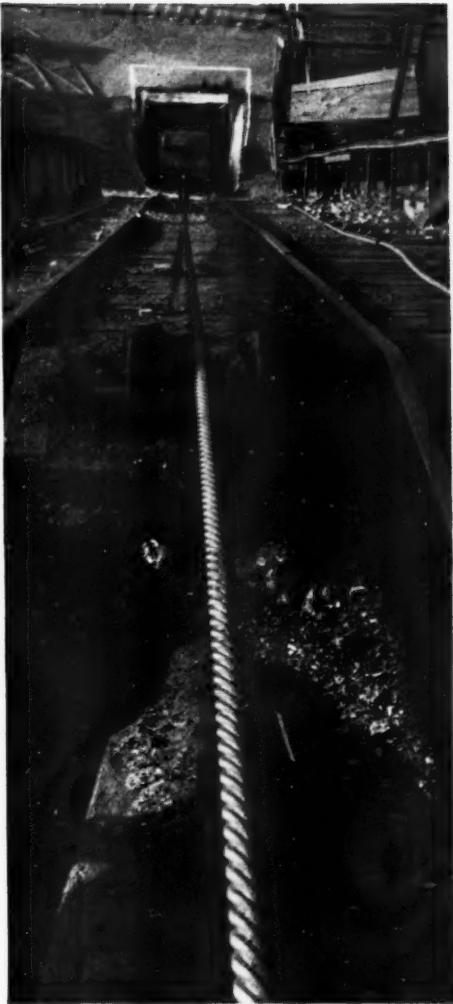
STATIONARY AIR COMPRESSORS



AIR TOOLS



ENGINES



Macwhyte Internal Lubrication gives you rope prepared especially for your service conditions—designed to resist abrasion, internal friction, and corrosion on slope hoists.



Macwhyte PREforming gives MONARCH WHYTE STRAND the flexibility for improved handling and long service. There's a type and size for all drag line equipment.

Here's special rope ... made for mining!

Monarch Whyte Strand wire rope is available in the correct type and size you need for your equipment. This rope is made by Macwhyte to give you long, heavy-duty service on draglines, strip shovels, mine hoists, slope hoists, mining machines, loaders, and other mining equipment.

Monarch Whyte Strand is supplied properly PREformed for flexibility, and properly lubricated, depending upon the use of the rope, to resist abrasion, corrosion, and give maximum service.

Give Monarch Whyte Strand a chance to serve you. You will be more than pleased with its performance. Your Macwhyte distributor is stocked for immediate delivery.

Monarch Whyte Strand Bulletin 5425 is available from your distributor or write direct to Macwhyte Company.

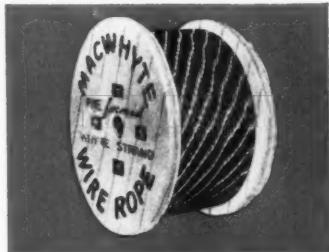
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Macwhyte Company, 2952 Fourteenth Avenue, Kenosha, Wis.

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MONARCH WHYTE STRAND is made by Macwhyte in every wire rope classification to provide the correct size and construction for all strip mining machines.

1002H

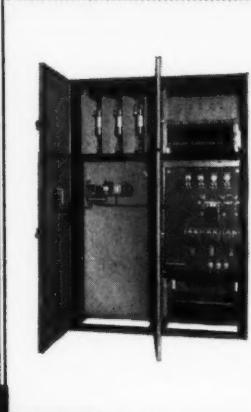
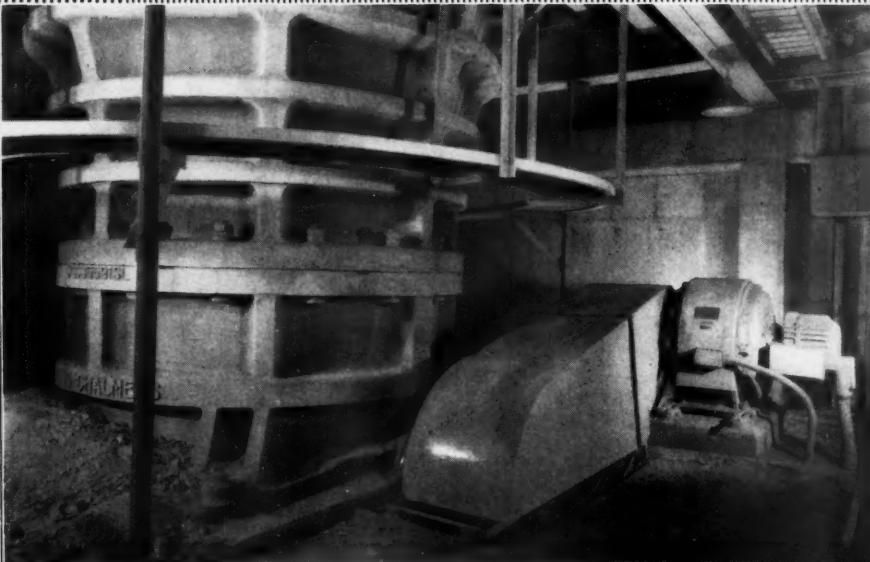


How "COORDINEERING" at

... Better

"Coordineering" may be defined as the integration of advanced thinking, planning and engineering that precedes the application of Allis-Chalmers equipment. With its staff, skill and experience, Allis-Chalmers is in a unique position to provide this valuable service.

Allis-Chalmers designs and builds all basic types



Crushing

An example of Allis-Chalmers "coordineering" is this crusher installation. Drawing on 75 years' experience in building and applying crushers, Allis-Chalmers control and crushing engineers developed a control circuit designed to cut costly downtime for the crusher installation shown above. In this circuit, motor overload protection is provided by two sets of thermal overload relays. One set operates at slight overload to sound warning. The second set stops the motor when temperature reaches the danger point.

Because of high starting torque and frequent starting under load, an Allis-Chalmers wound-rotor motor is used. In calculating horsepower requirements, the

factors of crushability, ratio of reduction, product size and specific gravity are evaluated.

Flexibility in the Crusher

The crusher is the *Superior* gyratory crusher which features "one-man, one-minute" positioning of main-shaft and mantle. This control facilitates emptying crushing chamber in case of power failure or other emergencies. It also compensates for wear on concaves and mantle and, when required, changes product size instantly. In Allis-Chalmers gyratory crushers, changing eccentricity, speed, or shape of chamber varies capacity and product size. This flexibility permits synchronizing crushing with other operations.

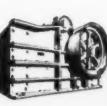
Superior is an Allis-Chalmers trademark.



Hammermills



Vibrating Screens



Jaw and Gyratory Crushers



Grinding Mills



Kilns, Coolers, Dryers

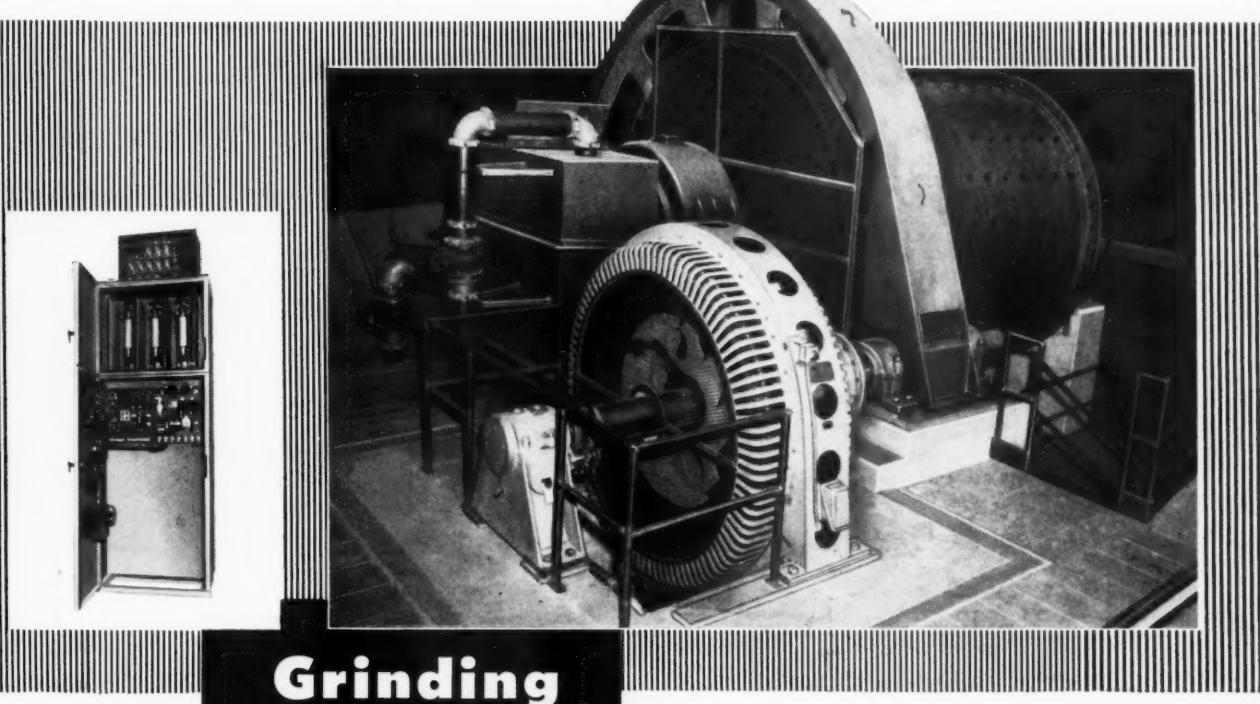
ALLIS-

Allis-Chalmers Provides Better Methods Results for You!

of processing machinery. In addition, the company manufactures complete lines of electrical generation, distribution and utilization equipment. As a result, Allis-Chalmers has a tremendous reservoir of experience—a most diversified team of research, engineering, manufacturing and application specialists—specialists who solve a given problem by

exchanging ideas and correlating specific know-how and skills.

Only Allis-Chalmers can give you truly integrated equipment—because only Allis-Chalmers can give you "coordinating."



Grinding

In solving a grinding application, requirements and variables are given a careful going over by an Allis-Chalmers team comprised of *grinding, motor and control* engineers. Characteristics of material, capacity, feed preparation, balance of gradations, torque characteristics, system power factor needs, control requirements are some of the many factors evaluated. Experience has proved that this thorough pre-application investigation and preparation pays off to the purchaser . . . *pays off in providing a modern, efficient grinding circuit with the lowest operating cost.*



You'll want Bulletin 25C6166D. It covers all equipment manufactured by Allis-Chalmers for the mining industries. See your nearby A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

An Integrated Grinding Mill Installation

In a typical application, the mill installed was a 10½ by 12-foot Allis-Chalmers diaphragm ball mill. The close diameter-length ratio is an important factor in producing the highest possible capacity per unit of power. Driving the mill is a 900-hp, 4000-volt, 257-rpm, 0.8 pf Allis-Chalmers synchronous motor. By providing desired power factor correction, this motor reduces power cost. The Allis-Chalmers starter is specially engineered to provide protection under all conditions of grinding operation.

A-4915

CHALMERS



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NEW Super Portable Rotary • RP900DA

Delivery, cfm.....	900
Control.....	New Simplified Thriftmeter
Length.....	13'9"
Width.....	6'9"
Height.....	8'5"
Turning Radius.....	18'
Weight, dry.....	12,790 lb.

NEW Super Rock Drill • DH143

Hammer Diameter.....	5½"
Drill Rod Size.....	1⅛" hex.
Weight, with crawler.....	10,500 lb.
Rod Change, up to.....	20'
Height, Mast at Vertical.....	29'
Length.....	11'
Width.....	8½'

NEW Gardner-Denver rock work team

Here's a new Gardner-Denver team for heavy-duty rock work in open cuts, in quarries, in open pit mines.

The new Gardner-Denver Rotary 900 Portable gives you extra air capacity for bigger drills or more of them —without additional engines and equipment to care for. Plus these popular Gardner-Denver features: clutch for easy cold-weather starting . . . circulating water system for warming up the compressor oil before it turns over . . . super-simplicity for easy field maintenance.

The new Gardner-Denver 5½" Model DH143 gives you an entirely new rock drill class. Now you can select the proper bit size and plan hole spacing for best breakage in any ground. All controls are conveniently mounted at the operator's station. Available with a new Gardner-Denver air-powered crawler, or for mounting on your own heavy diesel tractor.

Send for the facts today! There's a Gardner-Denver distributor in your area—see him for details.

GARDNER - DENVER

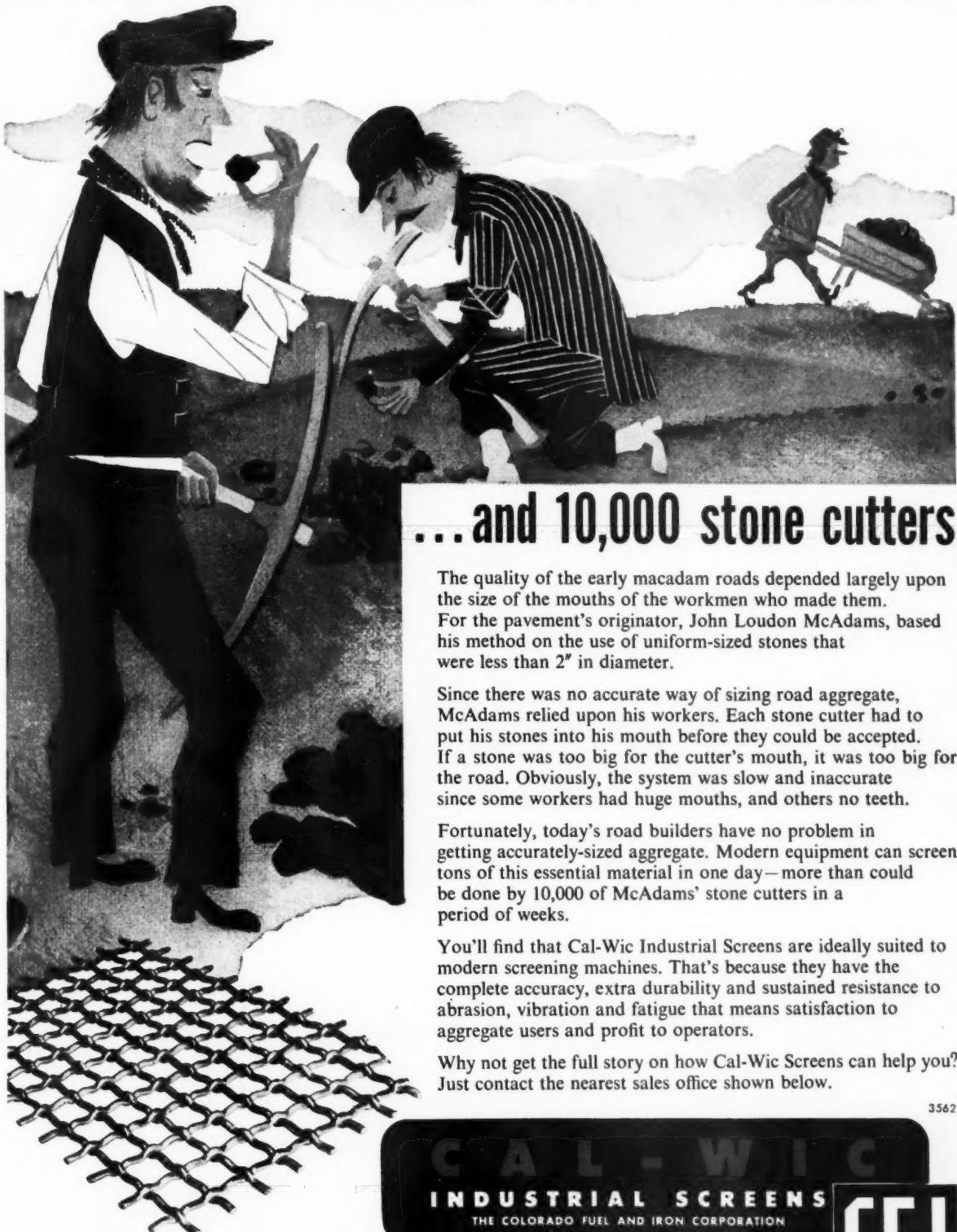
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CAL-WIC[®] INDUSTRIAL SCREENS



...and 10,000 stone cutters

The quality of the early macadam roads depended largely upon the size of the mouths of the workmen who made them. For the pavement's originator, John Loudon McAdams, based his method on the use of uniform-sized stones that were less than 2" in diameter.

Since there was no accurate way of sizing road aggregate, McAdams relied upon his workers. Each stone cutter had to put his stones into his mouth before they could be accepted. If a stone was too big for the cutter's mouth, it was too big for the road. Obviously, the system was slow and inaccurate since some workers had huge mouths, and others no teeth.

Fortunately, today's road builders have no problem in getting accurately-sized aggregate. Modern equipment can screen tons of this essential material in one day—more than could be done by 10,000 of McAdams' stone cutters in a period of weeks.

You'll find that Cal-Wic Industrial Screens are ideally suited to modern screening machines. That's because they have the complete accuracy, extra durability and sustained resistance to abrasion, vibration and fatigue that means satisfaction to aggregate users and profit to operators.

Why not get the full story on how Cal-Wic Screens can help you? Just contact the nearest sales office shown below.

3562

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INDUSTRIAL SCREENS
THE COLORADO FUEL AND IRON CORPORATION

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Tumbling terrain buried more than 500 feet of 5-year-old Anaconda 3/0 Awg SH-D Shovel Cable. Despite accident, cable continued to supply power without interruption to giant shovel.

...and the wall came tumbling down

When this 90-foot wall came down unexpectedly, a five-year-old length of Anaconda 3/0 SH-D Shovel Cable was buried under thousands of tons of jagged rock.

Yet — *after ten days* — the cable and shovel it supplied continued to operate! Later, the cable was relocated—and is still giving service.

NEW BUTYL INSULATION

Longer life, better performing cable is the result of advanced engineering and manufacturing know-how that go into all Anaconda mine cables. Securityflex® Type SH-D Shovel Cable, for

instance, is made with high-grade butyl insulation that withstands ozone, heat and moisture. Neoprene jacket is extremely tough and abrasion-resistant. Patented rubber cores cushion the ground wires and help prevent breaks.

Safety and economy of Anaconda cables have been proven in mines all over the world. The *Man from Anaconda* will be glad to help you on any cable problem. For cable, see your Anaconda distributor. And for copy of booklet, "... and the wall came tumbling down," write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Reg. U. S. Pat. Off.

56329

ASK YOUR DISTRIBUTOR FOR



Sharp corner of rock caught and held taut the Anaconda Shovel Cable — but didn't break it.



Giant rock scissors pinched the cable in viselike grip without damage to insulation or ground wires.



Like a guillotine, yet tons of rock did not puncture cable nor interrupt flow of power to the shovel.



Rockfall crushed and partially buried the cable all along its length — but not a single break occurred.

ANACONDA[®] MINE CABLE

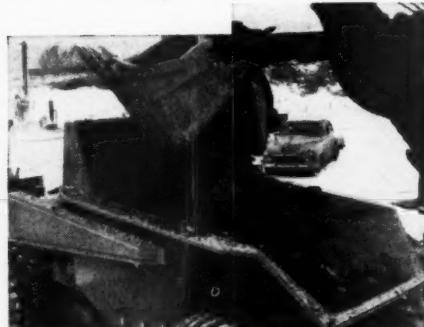


How Rear-Dump hauls 53% of shot material for Allegheny Mineral Corp.

These LeTourneau-Westinghouse machines—a 180 hp Tournatractor (now 208 hp) and an 18-ton Rear-Dump—have been used by Allegheny Mineral Corporation, Cowansville, Pennsylvania, since the summer of 1953 both for stripping and for hauling shot limestone. Units work alternately at Allegheny's pits in Parker's Landing and Kittanning. They make trips between the two places under their own power. The Rear-Dump drives the 35 miles through traffic in about an hour. Tournatractor makes the trip in about two hours. Fingertip electric power steer and 4-wheel air brakes (more braking surface on 1 wheel than most units have on all 4) make for safe high-speed travel.



Above Rear-Dump is being loaded by a 1½-yd. shovel. Loads in the shot limestone usually weigh out at around 19 tons each. Note simplicity of the Rear-Dump body design. Unit has no frame, no sub-frame, no springs or spring hangers, no front steering wheels, no hydraulics . . . hence seldom needs repairs.



Low entry from rear, plus big 9½' x 12' target, speed loading . . . reduce spillage. Triple-layered all-steel body absorbs shocks of heavy, sharply-fragmented rock. High all-steel front guard protects driver, controls. Capacity of this Rear-Dump, without sideboards, is 22 tons. Other models carry 9, 35, and 50 tons.



Hauling shot limestone 4/10 mile from pit to crusher, Rear-Dump reaches 15 mph speeds, despite narrow roads, short sections of 10 to 15% grades and several sharp curves. Tires give adequate traction even on snow and ice. Material being hauled will be crushed into agricultural limestone and road-surfacing.



Waste material is dumped about half a mile from the shovel. Company records show Rear-Dump averages 34 loads per 8-hour shift—as much as the shovel can load. Note how body swings below and behind rear wheels. This keeps material from piling under unit, also allows safe dump over steep banks.



Spoil dumped by the LeTourneau-Westinghouse Rear-Dump and another hauler is leveled by Tournatractor. Other duties for this 19 mph tractor include leveling and maintaining limestone aggregate stockpiles, pulling a 15-yd. scraper to self-load and strip dirt and rock, and pulling a ripper to loosen rocky material.



Tournatractor blade carries 2½ cu. yds. per push. Electric-control down-pressure provides smooth cut. Tires roll without damage over abrasive footing which badly damages crawler tracks. Says Co-Owner C. H. Snyder, "LeTourneau-Westinghouse units just fit our layout. Their maintenance is low and production high."

Tournatractor—Trademark TR-662-Q-B



LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

Why **NATIONAL** brushes are best for Electric Utility and Sub-Station Equipment

"National" brushes offer a complete line of proved grades to meet every condition of operation — standard or special — all through the mill and mine. Here, for example, are the grades recommended for

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Universally recognized leaders in AC field excitation equipment.
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Grade SA-45 for most standard DC excitation equipment. Other grades may be required to meet special operating conditions.

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Grade SA-45 Grade 259 Grade SA-35

Standard grades, choice being determined by machine characteristics.

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For unusual service — light loads or severe load swings.

AC SIDE OF ROTARY EQUIPMENT

Grade Cophite 29 Grade Cophite 39

Metal-graphite slip-ring formulation, applied according to current density.

EXCITER AND GENERAL PURPOSE DC EQUIPMENT

Grade 255 Grade 259 Grade SA-35

Standard choices, based on service requirement.

Grade 258
Special for low current density applications.



WITH VALUABLE EQUIPMENT, IT PAYS TO BE SURE —
CONSULT A "NATIONAL" CARBON BRUSH SPECIALIST!

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These are primarily mining men. All of them have state "papers" and training in mine rescue and first aid. In addition to their underground mining experience, they average 9.27 years as mine supervisors and 7 years

as field service engineers. These Kennametal men know and understand your problems and also know the qualities of the tools they sell.

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recommend the best tools for each job
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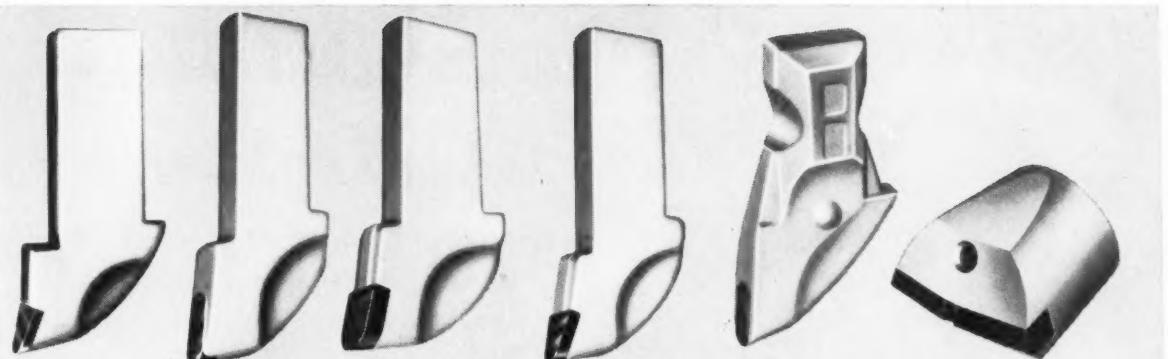
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*Registered Trademark



Style U-1

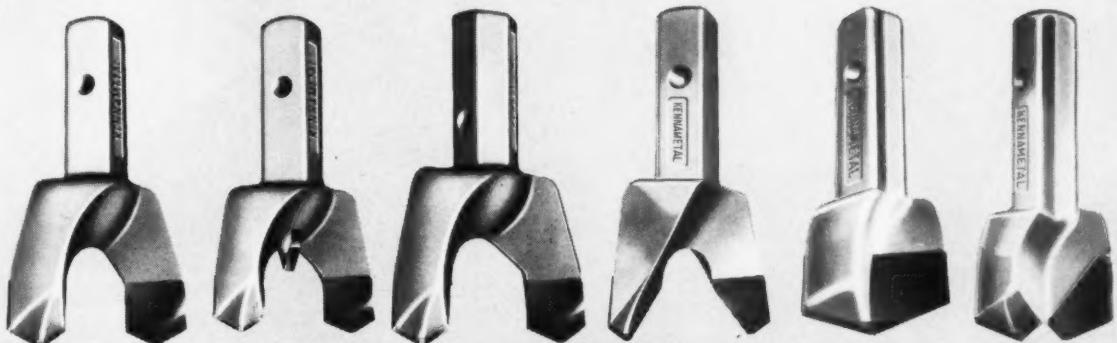
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Style U4H

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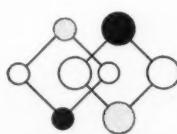


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A-9419



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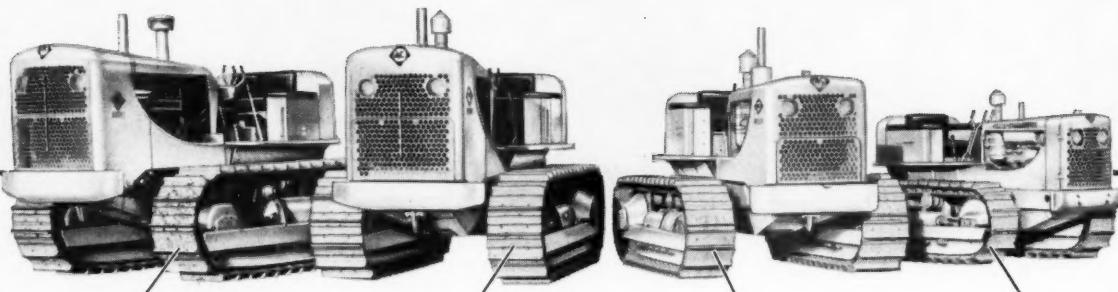
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**ALLIS-CHALMERS
HD-21 TORQUE
CONVERTER TRACTOR**

Hp — 204 net engine
Weight — 44,000 lb
Drawbar pull — up to
65,000 lb

ALLIS-CHALMERS HD-16 TRACTOR

Standard Transmission Torque Converter Drive
Hp — 141 belt
Weight — 31,500 lb
Drawbar pull — up to
37,700 lb

**ALLIS-CHALMERS
HD-11 TRACTOR**

Hp — 85 belt
Weight — 20,500 lb
Drawbar pull — up to
21,980 lb

**ALLIS-CHALMERS
HD-6 TRACTOR**

Hp — 55 belt
Weight — 12,400 lb
Drawbar pull — up to
12,650 lb

HERE IT IS . . . the all-new Allis-Chalmers line of crawler tractors . . . with more of everything you've wanted most for steady output—more work power, more long-life features, more easy maintenance and easy operation features, more versatility in every tractor.

You get all the benefits of Allis-Chalmers advanced basic design with the new Allis-Chalmers diesel engine . . . proved torque converter drive for the HD-21 and HD-16 . . . all-steel box-A main frame . . . unit construction . . . 1,000-hour lubrication intervals for truck wheels, idlers, support rollers . . . double-reduction final drives, and many other profit-producing features.

And there's a complete spread of tractor equipment — hydraulic and cable dozers, heavy-duty winches, hydraulic rippers. You can choose from a full line of tractor shovels ranging from 1½-yd to 4-yd capacity.

Behind this equipment are dealers with sales and service personnel and facilities that assure you expert "after sales" care. The True Original Parts they stock help give you continued top performance and long equipment life.

Your Allis-Chalmers dealer will show you how these feature-packed crawlers can do your jobs better and at lower cost. See him for full details.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION,
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Butte, Montana . . .

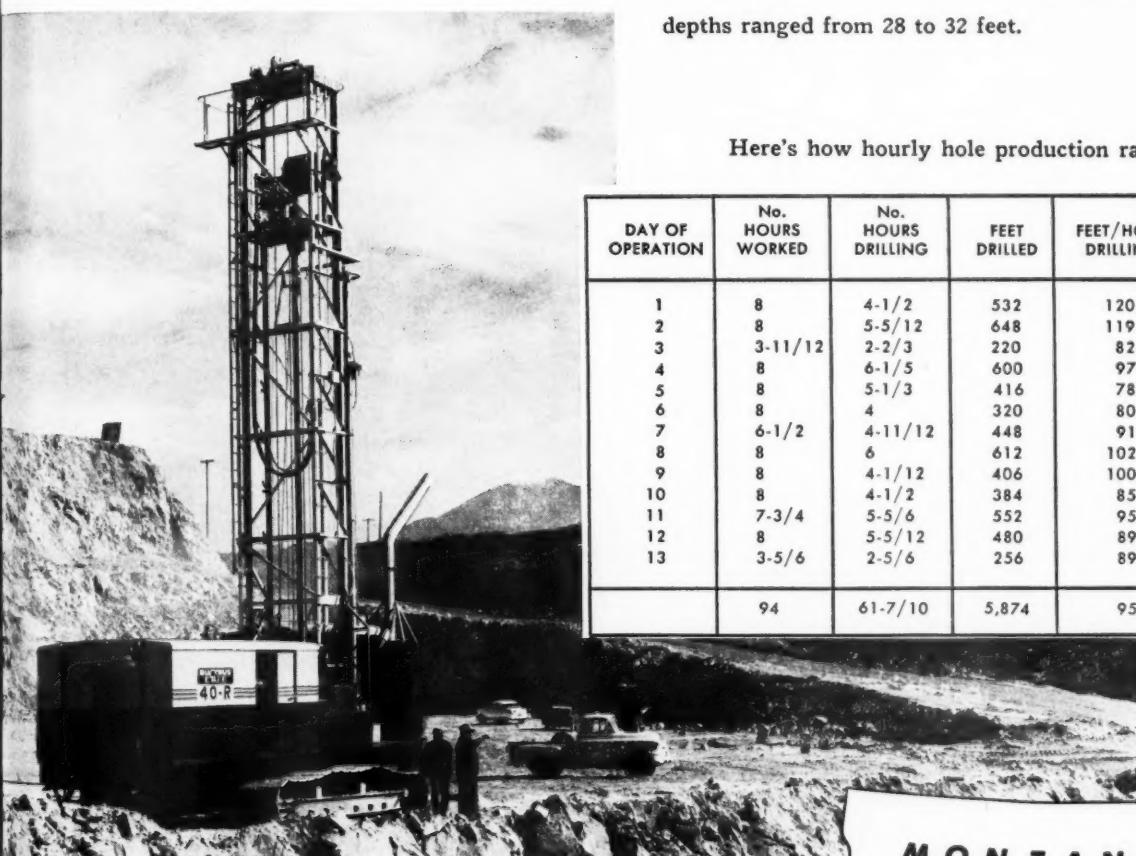
another example of how Bucyrus-Erie rotaries cut costs on big-volume stripping jobs

F & S Contracting Company and Morrison-Knudsen Company, Inc., joint venture stripping contractors on a large Montana copper property, have adopted a modern high-speed drilling program which allows maximum economy in use of shovel loading and truck hauling units. The drill chosen to meet their needs was this electrically powered Bucyrus-Erie 40-R rotary.

According to F & S officials, the 40-R has worked so rapidly that it has stayed ahead of a 6-yd. shovel, even when operating less than a full shift each day. Drilling procedure consists of putting down 9-in. diameter holes spaced on 21-ft. centers. A daily log for the initial period of operation shows the 40-R drilled 5,874 feet of hole through decomposed granitic rock in 62 hours drilling time—a rate of 95 feet per hour. Hole depths ranged from 28 to 32 feet.

Here's how hourly hole production ran:

DAY OF OPERATION	No. HOURS WORKED	No. HOURS DRILLING	FEET DRILLED	FEET/HOUR DRILLING	FEET/SHIFT HOUR
1	8	4-1/2	532	120	67
2	8	5-5/12	648	119	81
3	3-11/12	2-2/3	220	82	56
4	8	6-1/5	600	97	75
5	8	5-1/3	416	78	52
6	8	4	320	80	40
7	6-1/2	4-11/12	448	91	69
8	8	6	612	102	77
9	8	4-1/12	406	100	51
10	8	4-1/2	384	85	48
11	7-3/4	5-5/6	552	95	71
12	8	5-5/12	480	89	60
13	3-5/6	2-5/6	256	89	66
	94	61-7/10	5,874	95	62-1/2



When excavation quantities run high, the fast, large-diameter hole making ability of Bucyrus-Erie rotaries really pays off. Let us tell you how they can cut preparation time and drilling costs in your operations. Write today for detailed, illustrated literature. Model 40-R drills 6-3/4 to 9-in. holes and is available with either diesel-electric or full electric power. Model 50-R drills 9-7/8 to 12-1/4-in. holes and is electrically powered.

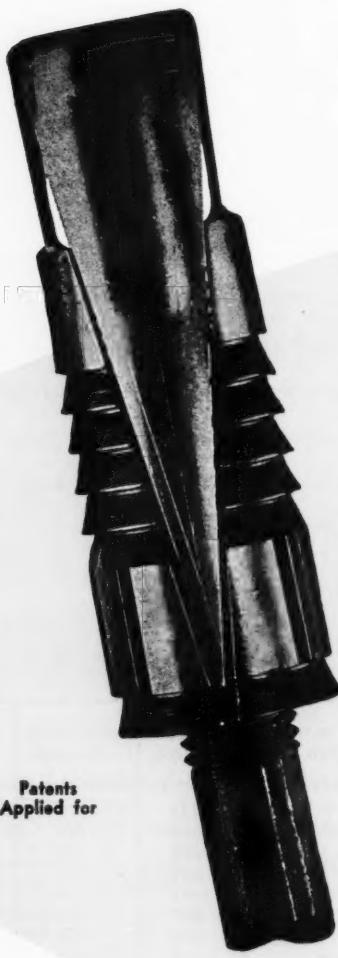
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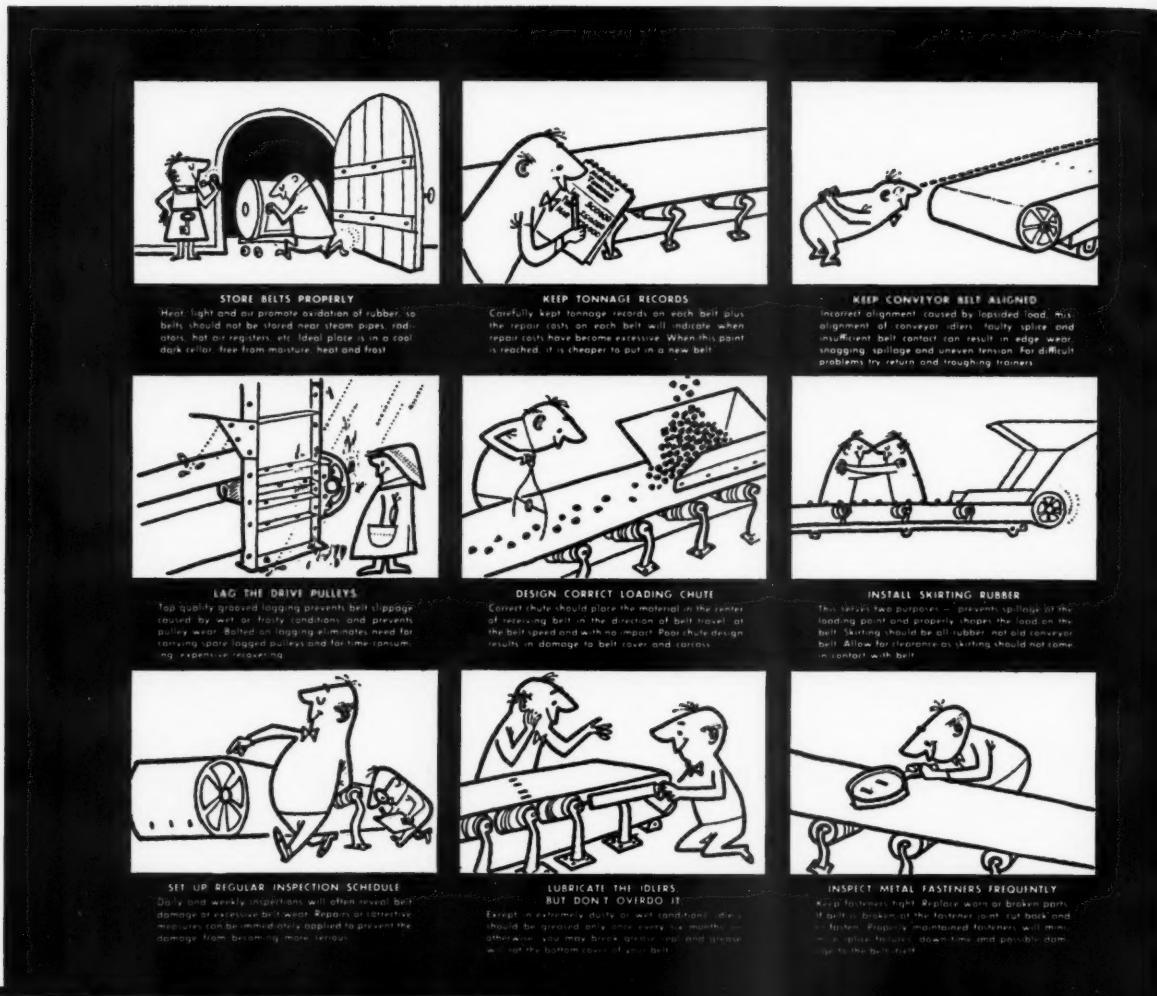
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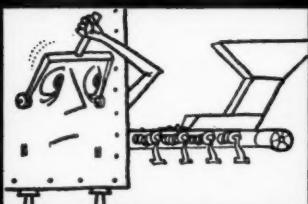
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Maltese Cross for exceptionally severe service. Ajax for general heavy duty service, and Monarch Neoprene for oily service. Maltese Cross Fiberglas Hot Material, Maltese Cross Fabric-type Hot Material and Hewitt Hot Service are especially designed for hot material handling.

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Conservo for portable conveyors. Ajax Rufftop, Conservo Rufftop, Conservo Transport and Hewlite for packaging conveyors.

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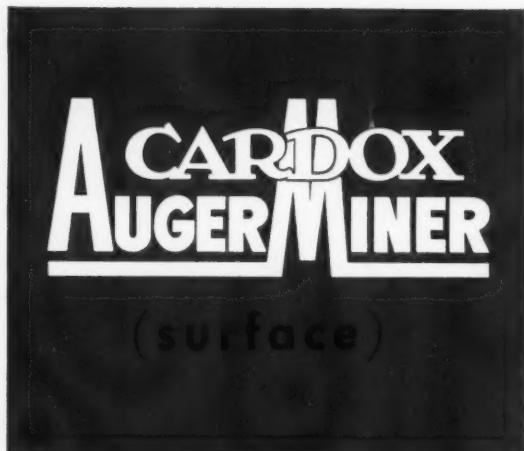
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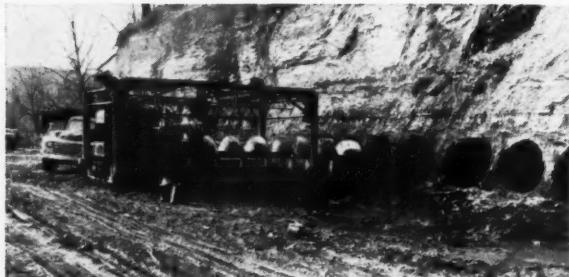
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Here is the latest and most profitable way yet to mine good coal from mines seemingly "worked out," because of excessive overburden. In fact, it is the cheapest method yet developed to bring out coal, on a per ton basis. "Big brute" of the CARDOX line, the 235 Surface AugerMiner is already running up remarkable records with "downtime" practically eliminated. Designed from end to end to bring out *more* coal at *lower* cost, it reduces drilling time per ton produced. There are a number of good reasons why.



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Coal comes out of the hole in a continuous flow, ready for mechanical loading onto waiting trucks by elevator conveyor. Manual handling is eliminated.



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Drills like this one — making holes up to 50" in diameter and going back as far as required — can bring out as much as 700 tons in a day, with a maximum of three men.

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Operates in 26' pit

Its compact construction helps this unit to produce maximum quantities of coal in minimum working space.

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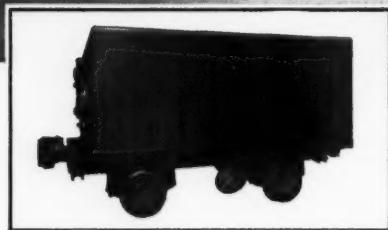
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String trolley wire first, follow up with feeder cable as it's needed—using just one fitting, just one tool (a hex wrench) for both jobs.

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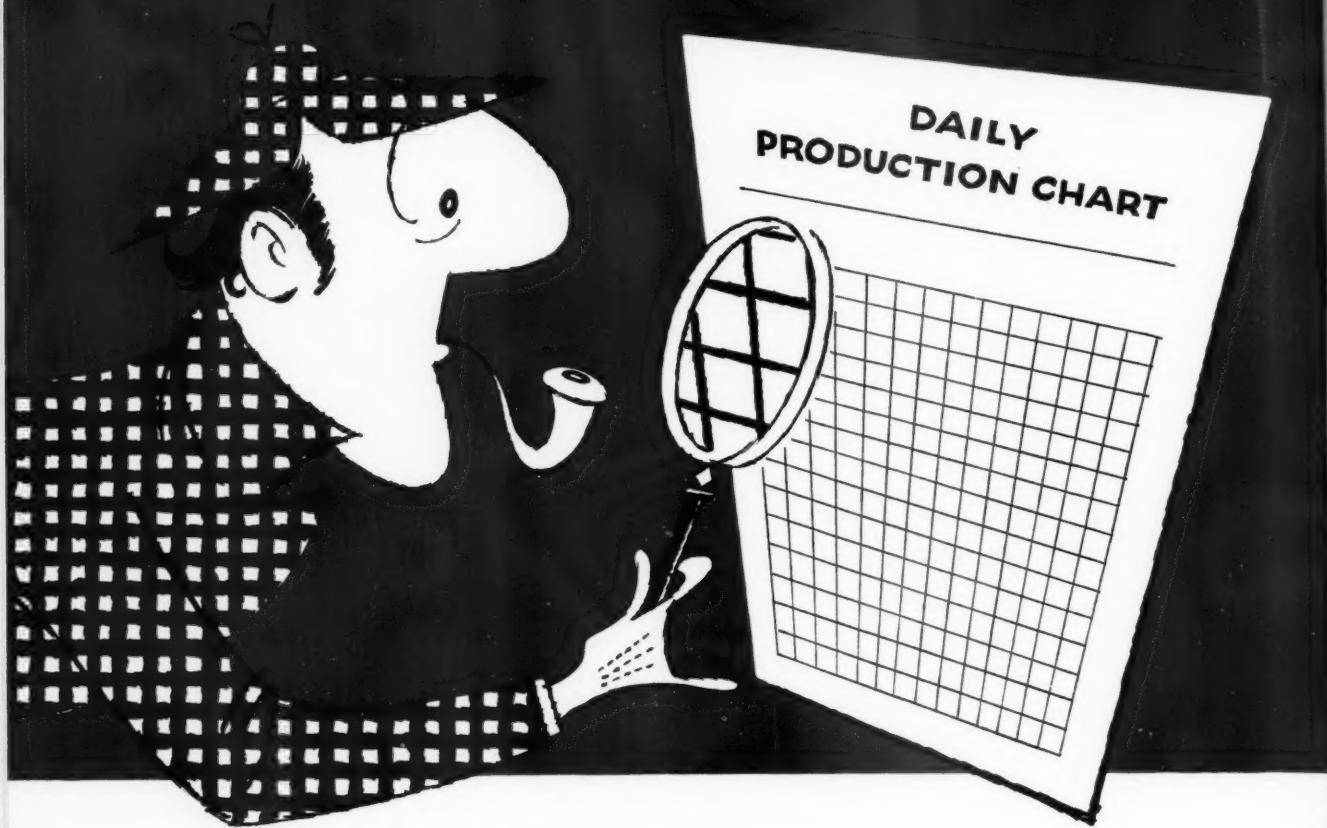
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What the records do show...especially the cost-per-ton records...is the opportunity for increased earnings that **Q C F** Constant Haulage offers you. Besides extra dependability and flexibility to safeguard your production...they provide two-way payloads and low cost operation.

Q C F standard cars give you the advantage of non-stop unloading, and **Q C F** Articu-Trip cars permit fast, continuous loading.

Actual cost and production records...supplied by mine operators...will prove to be profitable reading for you. Why not ask your friendly **Q C F** Representative to show you some typical case histories soon!

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Mining

CONGRESS JOURNAL

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS

ROBERT W. VAN EVERA, Editor

Volume 42

APRIL, 1956

Number 4

In the Interest of Progress

THE American Mining Congress strives to serve its members in many ways. Since its founding in 1898 it has been the one national organization representing the whole mining industry. One of the primary functions is to keep the industry informed of all vital matters—from Government activities to the most recent technological advances. MINING CONGRESS JOURNAL is one of the channels used to disseminate this information. Through it and the *AMC bulletins*, press releases, special mailings, a heavy correspondence, and the several conventions and meetings sponsored by the organization, the industry is kept informed of current developments that affect mining.

The AMC staff in Washington is made up of people who devote full time to the work of the organization, but the job would be impossible without the efforts of hundreds of men from responsible positions in industry who work on various committees, such as Tax, Labor, Public Lands, Tariffs and Stockpiling, Land and Water Use, Materials for Mining Equipment, Social Security, Energy Resources, Uranium, Gold, Strategic Minerals, Cement, Mine Safety and others.

It is often wise and expedient for the mining industry to join forces with other industries with which it has common interests, in opposing harmful legislation or in advocating sound and constructive measures. Many problems are handled through the established committees or, in cases where no regular committee exists, the AMC calls directly on members of the industry who can aid in achieving a solution.

On the operating or technical side the Coal Division, through its committees, subcommittees and task groups, has been a leader in the striking transition from hand labor methods to mechanization and the application of power machines to all phases of the mining cycle. The objectives originally set forth by this Division nearly 30 years ago—"to investigate and report on new methods and practices, their degree of success and the class of mines and conditions to which they can be applied; to learn what methods have proved the most successful and what factors have been responsible for the results that have been attained"—are accomplished through its Advisory Council and approximately 400 committee members, about equally divided between mine operators and equipment manufacturers. All are practical mining men—managers, engineers, consultants, and equipment designers. Their continued interest and participation attests to the success of these committees in saving coal mine operators time, effort and expenditure by making

the experiences of others available to guide their planning. MINING CONGRESS JOURNAL regularly publishes the finished Coal Division reports.

These committees have continued through the years and have thus been able to follow events in orderly sequence, devoting as much time to any particular subject as it may warrant. Their work is recognized in the industry as an important factor in promoting better methods and improved equipment which have resulted in higher efficiency, increased production and greater safety.

The AMC Coal Conventions and Coal Shows climax each year's work, bringing the entire industry up to date on the many new developments in mining techniques, and sparking further progress. Meeting on common ground, operating men and manufacturers are better able to clearly define the problems and to resolve them through considered application of the most modern equipment, tools, methods, and management practices.

In the same way, Mining Congress Conventions and Expositions for the metal mining and industrial minerals industries include a wide range of operating and technical sessions. Many feel that these sessions could be made still more effective by setting up continuing committees to see that the best possible information is assembled and presented, and that it is properly followed up at subsequent meetings.

In line with this thinking a committee has now been formed to work in the interests of underground drilling progress, covering the subjects of drill machines, bits, and drill steel, for the benefit of the entire mining industry. Seven men were invited to participate on the committee—all of whom accepted. There are many others who could effectively contribute to this activity, so the membership has been set up on a revolving basis with the intention that others be brought in as time goes on.

We are eager to see what this new committee will accomplish and how the industry will react to and support its work. It seems to us that the opportunity to perform a real service through such joint activity of operators and manufacturers, in this and other phases of mining, is almost unlimited.

Signs of Health

FROM all sections of the country we receive news of expansion in the cement industry. A recent study by the U. S. Bureau of Mines shows that facilities capable of producing an additional 46 million barrels annually of finished Portland Cement are scheduled for completion by the end of this year. Expanded facilities of 17 million barrels annual capacity came into production in 1955, bringing the total capacity to 311 million barrels as of the end of that year. Cement production has increased each year since 1947, and still the great demands of the construction industry call for more expansion.

We estimate that the current 311 million barrels capacity requires approximately 100,000,000 tons of mineral raw materials, and that the approximate annual fuel and power requirements of our cement plants are equivalent to some 18,000,000 tons of coal. Cement is indeed an important segment of the mineral economy.

It is apparent that we have in America a healthy cement industry which foresees the future requirements of the construction business and is determined to be ready for new markets brought about by expanded highway programs and new applications in structural design.



Strip mine haulage roads in North Dakota have to "take it" under a wide variation in temperature and weather

Haulage Roads for Strip Mines

Wide Roads that Follow the Land Contour and Have Good Drainage are this Company's Answer to Haulage Under Adverse Conditions

- COLDER tomorrow with snow
- Low tomorrow morning minus 25°
- High tomorrow minus 12°
- Present temperature: 10° below zero

To many sections of the United States such a weather forecast would close the schools and paralyze industry. To Dakota Collieries Co. in Zap, N. D., it is "business as usual." By planning for below zero temperatures, Dakota Collieries hasn't missed an operating day in the last four years.

North Dakota is a strip mining state, and has been from the time that the first settlers scraped the few feet of overburden from outcropped lignite for their personal use. Several large underground mines have been in operation through the years but, at the present time, about 99 percent of the coal mined in the state is produced from strip mines. Several small mines produce coal for local consumption, but the greater part of the production is secured from mines producing from 300 to 600 tons per hour.

These so-called large mines are considered fairly modern in every respect. Preparation plants have been erected by well known manufacturers, power

shovels with dipper capacities to 25 cu yd and draglines with bucket capacities to 15 cu yd are used in overburden removal. Power shovels of about five cu yd capacity are used in coal loading.

At all of these mines, haulage of coal is by diesel-powered trucks of about 20-ton capacity and is on roads constructed and maintained by the mine operators.

Haul in All Kinds of Weather

Lignite, sometimes called brown coal, is a low-grade fuel with a Btu content of about 7000, and with a moisture content of about 35 percent. It cannot be stored successfully as it will break down when exposed to the weather. Because of this, and because most of the production is used in steam generating plants, a mine operator must be prepared to load coal in any kind of weather. Thus, it is very necessary that our roads be constructed so that a steady production of coal is insured.

In common with many other mines, Dakota Collieries does not have the type of equipment generally regarded by road contractors as standard equip-

By RALPH RICHARDSON

Executive Vice-President
Dakota Collieries Co.
A Division of Twin Star Industries, Inc.

ment. Theirs include, of course, scrapers, packers, and the like. All of our road construction is done by bulldozers, a road patrol, a diesel-powered dragline, and the haulage trucks. The road patrol does all preliminary work in connection with road construction, with assistance from the bulldozers when the amount of dirt to be moved becomes excessive. The dragline is employed when cuts are necessary. Material from the cuts is spilled about 60 ft from the road and parallel with it—thus forming an effective snow fence, keeping in mind that the winds prevail from the Northwest.

Standard road construction procedure is followed. Curves are kept as gentle as possible and, where impossible, super-elevated. Grades are, of course, kept at a minimum.

Dakota Collieries has always avoided large fills as the soil is sandy and difficult to compact. Where fills are necessary it is better to add layer by layer, at the rate of several feet per year,

until the desired height is reached. This gives a solid roadbed at all times with the minimum of trouble.

The company's coal land is considerably higher than the location of the preparation plant. Naturally, it is necessary to negotiate that difference in some manner, and Dakota Collieries is fortunate in being able to do it with empty haulage units.

Use Stepped-Type Grades

Where grades are to be negotiated, the company believes that a stepped-type road can be used to advantage. This type of road involves alternate stretches of level road, and short, comparatively steep rises. Therefore, less clutching is required in trucks equipped with standard transmissions. There is less lugging on the up-grade and, in this case, less over-speeding on the down grade. Constant lugger, shifting and over-speeding results in driver fatigue, more repairs, and more down time for trucks.

Main roads should be built with wide road beds. Because of blowing and drifting snow in the winter time, wide roads give a coal operator in areas of heavy snowfall better opportunity to keep the roads open. This also is an important safety factor. By having wide roads on the main haulage run, dusty conditions in the dry season are much improved.

Haulage roads should be constructed on natural ridges of the land insofar as possible. The road must be built higher than the surrounding land so that the snow will blow off in the winter, and there will be good drainage in the summer.

Plan for Worst Conditions

Road drainage is very important as the roadbed will not stand up if the water is allowed to remain on the road. It is an excellent idea to inspect your roads after extremely heavy rains to see that the water drains properly. If it doesn't, it would be well to fix that particular area as soon as equipment is available.

Rather than erect snow fences, Dakota Collieries uses a patrol or bulldozer to ridge the snow parallel to the road at a distance of about 50 ft. This makes a very effective snow fence and it is also inexpensive.



One-way traffic in the pits makes for more efficient haulage

dozer to ridge the snow parallel to the road at a distance of about 50 ft. This makes a very effective snow fence and it is also inexpensive.

It should be axiomatic to construct a haulage road with the idea in mind that it will be available for use under the most severe weather conditions. Then there will be no trouble in normal weather.

Entrances to pits, if at all possible, should be one way. The turning and backing of large haulage units is a time waster. It is the practice at Dakota Collieries to travel on the coal berm with the trucks. It is possible to make a fairly smooth roadbed by the use of a scarifier and a road patrol.

As an aid to better roads, the coal company has developed in its shops a vertical coal cutter which is used to cut the coal to a depth of about 10 ft, thus forming a straight wall when the coal is removed. This prevents the loading shovel from accidentally breaking out a chunk of coal from the berm; permits faster loading for the shovel; and gives better coal recovery. It also permits a narrow berm, which is a great help in the dragline operation.

Hard Surface Roads

Hard surfaced haulage roads have never been used in the strip mines of North Dakota. There is an excellent reason for this. The North Dakota

State Highway Department has encountered difficulty with blacktop roads because of the extremes in temperature, and road restrictions which they impose in the spring reduce the payload to practically nothing. Even so, it has been almost impossible to maintain good blacktop roads.

Because of the capital investment in concrete roads, and because of slippery conditions in adverse weather, their use has never been considered.

Several states, including Illinois, Texas, North Dakota, and others, are using salt as a road surface stabilizer. This is relatively inexpensive, makes a dust-free road, and might be worthy of study.

Most of the mines in North Dakota use a material called "scoria" for road surfacing. Scoria is a red, gravel-like material which was formed by the natural burning of lignite lying close to the surface and baking the clay above it. This baked clay, although not as lasting as gravel, is available in large quantities close to the mining operations. It is generally applied to the road without crushing as the material breaks easily under pressure. About three in. of scoria is applied to the road every spring and this application usually lasts the entire year. It is readily worked with a road patrol and generally makes a good all-weather road.

Winter Maintenance

Road maintenance is very vital to constant high production at any mine. In the winter time, the roads must be cleared of snow before the trucks start to operate, thus avoiding slippery conditions caused by compacted snow. It is the practice at Dakota Collieries to start the road patrol two hours before the loading time in the winter and, in case of a bad storm, two bulldozers are sent out at that earlier time. The entire road is patrolled every other day. Thus, a smooth running surface is maintained at all times.

Constant high production must be maintained at any mine, and good roads are the only way that this can be accomplished.



A native material, scoria, is used for road surfacing



State of Optimism Pervades Coal Industry as It Prepares for Annual Convention in Cincinnati. American Mining Congress Putting Final Touches to Program and Entertainment Plans

... 1956 Coal

THE "all-star revue" of coal mining is scheduled for Cincinnati, Ohio, May 7-9, when the 1956 Coal Convention of the American Mining Congress is held at the Netherland Plaza Hotel. Top men from leading coal company management and production teams will describe new and better ways to mine the coal the Nation so heavily depends upon, and seek solutions to the problems facing the industry. Mining men from all over the country will gather to hear and discuss nearly 50 reports dealing with all phases of coal production.

Many outside the industry will also be on hand. Coal's advances in mechanization and mining technology will be put "on display," and metal and nonmetallic mining men, who have already taken many pages from the record of coal mining advances, will be present to learn what can be applied to their particular fields.

The Program Committee, headed by Chairman G. A. Shoemaker, executive vice-presi-

dent, Pittsburgh Consolidation Coal Co., has developed an extraordinary program in keeping with the outstanding AMC conventions of the past. A look at the final convention program on the following pages will show that a fine geographical balance has been arranged as well as full coverage of the industry's most pressing problems. All who attend will find a great deal of pertinent information that can be put to immediate and advantageous use.

New mining equipment will be described. The application of industrial engineering to coal mining, a subject that is vitally important and receiving particular attention at this time, will be thoroughly aired. Comparisons of different ways to do the same job will be brought out and fully discussed. Strip mining, maintenance, continuous mining, coal preparation, roof support — these and many other topics will be thoroughly discussed in the 11 convention sessions.



L. C. CAMPBELL
Vice-President
Eastern Gas & Fuel Associates
Chairman, Coal Division



G. A. SHOEMAKER
Executive Vice-President
Pittsburgh Consolidation Coal Co.
Chairman, Program Committee



GUY V. WOODY
General Machinery Division
Allis-Chalmers Manufacturing Co.
Chairman, Manufacturers Division

Convention

In addition to the many technical papers, a general session on the opening day will be devoted to a practical look at coal's future and the relationship between railroads and the coal industry. Two business luncheons will feature talks on subjects in which all mining men are interested. At the Monday luncheon Phillip Sporn, president, American Gas & Electric Service Corp., will discuss sources of energy for electric generation in the next two decades, bringing out the prospective relationship between coal and atomic power in this field. In a switch from tradition, Red Smith, sports columnist of the *New York Herald Tribune*, will tell luncheon guests on Tuesday about great moments from the world of sports.



HOWARD L. YOUNG
President
American Zinc, Lead & Smelting Co.
President, American Mining Congress



JULIAN D. CONOVER
Executive Vice-President
American Mining Congress

Ladies Coming Too

A special invitation has been extended to the ladies to come to Cincinnati for the meeting. They, of course, are cordially invited to attend all Convention functions and a spe-

Luncheon Speakers



FRANKLIN D. SPORN, President of the American Gas & Electric Service Corp., will speak at the Monday luncheon on "Sources of Energy for Electric Generation in the Next Two Decades".



In a change of pace, the Tuesday luncheon crowd will hear RED SMITH, sports columnist of the New York Herald Tribune, tell about "Highlights in the World of Sports".

cial program of three day-time events has been arranged for their particular entertainment. At a Welcoming Luncheon on Monday they are in for something different—a fashion program in an original pattern, "Gumption, Grooming and Glamor." This will follow a get-acquainted luncheon in the beautiful Rookwood Room at the Hotel Sinton.

Tuesday will feature a restful cruise on the Ohio River, with a buffet luncheon served en route. This trip was one of the highlights of Convention Week two years ago. Round-trip bus transportation has been arranged from the Netherland Plaza Hotel directly to the boat.

On Wednesday a luncheon will be held at the Summit Hills Country Club. A delightful trip through the Kentucky countryside will include a stop for a brief conducted tour

through St. Mary's Cathedral in Covington, reputed to be one of the most beautiful and interesting churches in the country. Attractions include a number of Frank Duvenek's original paintings.

Headquarters for the ladies will be in the Julep Room on the third floor at the Netherland Plaza. Someone familiar with all Cin-

(Continued on page 55)

Session Chairmen



J. A. Brookes
Pickands Mather
& Co.



W. W. Everett
Glen Alden Corp.



T. G. Gerow
Consultant



James C. Gray
U. S. Steel Corp.



V. D. Picklesimer
South East Coal Co.



F. Earle Snarr
Freeman Coal Mining
Co.



P. L. Shields
Spring Canyon Coal
Co.



J. A. Stachura
Enoco Collieries, Inc.



G. H. Utterback
United Electric Coal
Cos.



R. R. Williams, Jr.
Colorado Fuel &
Iron Corp.



R. E. Salvati



W. W. Patchell



Hon. J. P. Saylor



James Hyslop



Wm. W. Youngblood



W. C. Spencer

Convention PROGRAM

Monday—May 7

9:30 A. M.—PRE-SESSION MOTION PICTURE

"At This Moment"—The Operation of American Railroads.

10:00 A. M.—OPENING SESSION

Opening of Convention: G. A. SHOEMAKER, Exec. Vice-Pres., Pittsburgh Consolidation Coal Co.; National Chairman, Program Committee.

A Practical Look Into Coal's Future

R. E. SALVATI, Pres., Island Creek Coal Co., Huntington, W. Va.

The Railroads and The Coal Industry

W. W. PATCHELL, Vice-Pres., Research and Development, Pennsylvania Railroad Co., Pittsburgh.

The Congress and the Coal Industry

HON. JOHN P. SAYLOR, U. S. Representative from Pennsylvania.

12:15 P. M.—LUNCHEON

Presiding: L. C. CAMPBELL, Vice-Pres., Eastern Gas & Fuel Associates; Chairman, Coal Div., American Mining Congress.

Address:

Sources of Energy for Electric Generation in the Next Two Decades

PHILIP SPORN, Pres., American Gas & Electric Service Corp., New York.

1:45 P. M.—PRE-SESSION MOTION PICTURE

"Glass and You"—A History of Glass Making

2:15 P. M.—STRIP MINING

Chairman: G. H. UTTERBACK, Secy.-Treas., United Electric Coal Cos., Chicago.

Engineering Development and Economics of the 60-Yd Shovel

JAMES HYSLOP, Pres., Hanna Coal Co., St. Clairsville, Ohio.

Discussion:

A. F. BUSICK, Vice-Pres., Marion Power Shovel Co., Marion, Ohio.



Donald B. Shupe



S. P. Carter



B. R. Walburn

Time Study on Stripping Shovels

WILLIAM W. YOUNGBLOOD, Supt., Mine No. 2, Midland Electric Coal Corp., Farmington, Ill.

Truck Haulage With Large and Small Units

W. C. SPENCER, Asst. Chief Engr., Pittsburg & Midway Coal Mining Co., Pittsburg, Kans.

Discussion:

FRED BRAMER, Equipment Supt., Enos Coal Mining Co., Oakland City, Ind.

1:45 P. M.—PRE-SESSION MOTION PICTURE

"Costa Rica"—A travelogue.

2:15 P. M.—MAINTENANCE

Chairman: R. R. WILLIAMS, JR., Mgr. Mining Dept., Colorado Fuel and Iron Co., Pueblo, Colo.

A Modern Maintenance Organization

DONALD B. SHUPE, Mine Supt., Eastern Gas & Fuel Associates, Wharton, W. Va.

Mine Lighting Improves Safety, Production and Working Conditions

S. P. CARTER, Supt. Maint., Coal Div., Armco Steel Corp., Montcoal, W. Va.

Discussion:

ROBERT E. HAVENER, Elec. Engr., Mine Safety Appliances Co., Pittsburgh.

Maintenance of Ventilating and Power Conversion Equipment

B. R. WALBURN, Gen. Master Mech., Vesta-Shannopin Div., J. & L. Steel Corp., California, Pa.

**2:15 P. M.—ANNUAL MEETING,
MANUFACTURERS DIVISION**



Michael Yonko



E. H. Roberts



G. W. Lockin



Robert Billings



R. N. Morris



Matthew Turkovich



C. C. Cornelius



D. H. McFadden



H. A. Cassell

Tuesday—May 8

9:30 A. M.—PRE-SESSION MOTION PICTURE

"Steel Spans the Chesapeake"—Bethlehem Steel Co.

10:00 A. M.—CONTINUOUS MINING

Chairman: F. EARLE SNARR, Vice-Pres., Freeman Coal Mining Co., Chicago.

Continuous Mining With Extensible Belts

MICHAEL YONKO, Gen. Mgr., Powhatan Mining Co., Powhatan Point, Ohio.

Continuous Mining in Low Coal

E. H. ROBERTS, Supt. Maint., and G. W. LOCKIN, Prod. Engr., Inland Steel Co., Wheelwright, Ky.

Five Years of Continuous Mining

ROBERT BILLINGS, Asst. to Prod. Mgr., Rochester & Pittsburgh Coal Co., Indiana, Pa.

The Wilcox Miner

R. N. MORRIS, Asst. to Vice-Pres., C. H. Mead Coal Co., Div. of North American Coal & Dock Co., East Gulf, W. Va.

9:30 A. M.—PRE-SESSION MOTION PICTURE

"Paper in the Making"—International Paper Co.

10:00 A. M.—COAL PREPARATION

Chairman: W. W. EVERETT, Vice-Pres., Glen Alden Corp., Wilkes-Barre, Pa.

Washery Water Clarification to Prevent Stream Pollution

MATTHEW TURKOVICH, Dir. of Prep., Island Creek Coal Co., Holden, W. Va.

Discussion:

JOHN GRIFFEN, Coal & Coke Consultant, Pittsburgh.

The Joanne Cleaning Plant

C. C. CORNELIUS, Vice-Pres., Oper., Baton Coal Co., Pittsburgh.

Barge Loading Systems

D. H. MCFADDEN, Asst. Chief Engr., Ayrshire Collieries Corp., Indianapolis, Ind.

Discussion:

JOHN DONAN, Consulting Engr., Madisonville, Ky.

12:15 P. M.—LUNCHEON

Presiding: GUY V. WOODY, Allis-Chalmers Mfg. Co., Chairman Manufacturers' Division, American Mining Congress.

Address:

Highlights In the World of Sports

RED SMITH, Sports Columnist.

1:45 P. M.—PRE-SESSION MOTION PICTURE

"The Sun Goes North"—Florida Citrus Commission.

2:15 P. M.—ROOF SUPPORT

Chairman: P. L. SHIELDS, Pres., Spring Canyon Coal Co., Salt Lake City.

Pillar Mining Making High Recovery

H. A. CASSELL, Div. Supt., Pocahontas Fuel Co., Pocahontas, Va.

Discussion:

PAUL GILL, Chief Mining Engr., Clearfield Bituminous Coal Corp., Indiana, Pa.

SYMPOSIUM ON ROOF BOLTING

Roof Bolting Machines

ROBERT FLETCHER, Vice-Pres., J. H. Fletcher & Co., Huntington, W. Va.

Methods at Jenkins, Ky.

M. E. PRUNTY, Safety Dir., Consolidation Coal Co. (Ky.), Jenkins, Ky.

Bolting to Increase Safety

E. M. THOMAS, Min. Engr., Chg. Roof Control, U. S. Bureau of Mines, Washington, D. C.

Advantages of Bolting

WM. J. McCULLOUGH, Safety Dir., Snow Hill Coal Corp., Terre Haute, Ind.

(Continued next page)



Robert Fletcher



M. E. Prunty



E. M. Thomas



Wm. McCullough



H. E. Jones, Jr.



Ralph B. Dean



John H. Gooch



H. L. Beattie



L. I. Cothern



Andrew E. Hamlet



Andrew Gaber



J. L. Thornton



J. H. Nash

1:45 P. M.—PRE-SESSION MOTION PICTURE
"Horizon Unlimited"—U. S. Navy Rocket Film.

2:15 P. M.—INDUSTRIAL ENGINEERING

Chairman: J. A. BROOKES, Gen. Mgr., Mather Collieries, Pickands Mather & Co., Mather, Pa.

Industrial Engineering and Cost Controls

An Executive Viewpoint:

H. E. JONES, JR., Exec. Vice-Pres., Amherst Coal Co., Lundale, W. Va.

An Operating Viewpoint:

RALPH B. DEAN, Admin. Asst., The Lorado Coal Mining Co., Columbus, Ohio.

Discussion:

JOHN W. STRATON, Dir. of Industrial Engr., Princess Elkhorn Coal Co., David, Ky.

WALTER WEAVER, Asst. Mining Industrial Engr., Vesta-Shannopin Div., J. & L. Steel Corp., California, Pa.

An Analysis of Industrial Engineering as Applied to Coal Mining

JOHN H. GOOCH, Management Consultant, Ingle Coal Co., Elberfeld, Ind.

Wednesday—May 9

9:30 A. M.—PRE-SESSION MOTION PICTURE
"The Suspension Bridge"—U. S. Steel Corp.

10:00 A. M.—COAL PREPARATION

Chairman: JAMES C. GRAY, Vice-Pres. Coal Div., U. S. Steel Corp., Pittsburgh.

Salvaging Coal from Washery Rejects

H. L. BEATTIE, Vice-Pres., Elk River Coal & Lumber Co., Widen, W. Va.

L. I. COTHERN, Dir. of Engr., Jewell Ridge Coal Corp., Tazewell, Va.

The Corbin, Kentucky, Cleaning Plant

ANDREW E. HAMLET, Supt., Coal Cleaning Plant, U. S. Steel Corp., Corbin, Ky.

The Buckheart Preparation Plant

ANDREW J. GABER, Prep. Engr., The United Electric Coal Companies, Canton, Ill.

9:30 A. M.—PRE-SESSION MOTION PICTURE
"This Is Lumber"—West Coast Lumbermen's Assn.

10:00 A. M.—HAULAGE AND POWER

Chairman: V. D. PICKLESIMER, Vice-Pres., South East Coal Co., Seco, Ky.

Fire Resistant Mine Conveyor Belts:

Fire Resistant Belt Construction

J. L. THORNTON, Mgr. Belting Sales, The Goodyear Tire & Rubber Co., Inc., Akron, Ohio.

Electrical Protective Devices

J. H. NASH, Elec. Engr., Ensign Electric & Manufacturing Co., Huntington, W. Va.

(Continued next page)



S. P. Polack



W. R. Morton



F. R. Sell



C. B. Peck, Jr.



Frank Williams, Jr.



Joe T. Taylor



J. O. Cree



R. L. Richardson



Arnold E. Lamm



Wm. C. M. Butler, Jr.



Roy M. Leseney

Preventing Underground Conveyor-Belt Fires

S. P. POLACK, Health and Safety Engr., U. S. Bureau of Mines, Pittsburgh.

Automation of Mine Haulage

W. R. MORTON, Application Engineer-Mining, General Electric Co., Schenectady, N. Y.

Trends In Underground Power

F. R. SELL, Senior Ind. Power Fngr., West Penn Power Co., Greensburg, Pa.

C. B. PECK, JR., Mgr. Ind. Sales, Anaconda Wire & Cable Co., New York.

1:30 P. M.—PRE-SESSION MOTION PICTURE

"In the Beginning"—Geology of the Grand Canyon.

2:00 P. M.—CONTINUOUS MINING

Chairman: **JOHN A. STACHURA**, Gen. Supt., Enoco Collieries, Inc., Vincennes, Ind.

Continuous Mining in Medium Height Coal

FRANK WILLIAMS, JR., Gen. Mgr., Peck's Run Coal Co., Buckhannon, W. Va.

Discussion:

J. C. LEIGHTON, Carboloy Dept., General Electric Co., Detroit.

Continuous Mining in Pillars in High Coal

JOE T. TAYLOR, Mining Engr., Kaiser Steel Corp., Sunnyside, Utah.

Power for Continuous Mining

J. O. CREE, Elec. Engr., West Virginia Engineering Co., Charleston, W. Va.

Discussion:

C. E. McWHORTER, Mng. Engr., Goodman Mfg. Co., Chicago.

1:30 P. M.—PRE-SESSION MOTION PICTURE

"Metallurgy Plus"—Republic Steel Corp.

2:00 P. M.—STRIP MINING

Chairman: **T. G. GEROW**, Consultant, Chicago, Ill.

Haulage Roads for Strip Mining

R. I. RICHARDSON, Exec. Vice-Pres., Dakota Collieries Co., Div. of Twin Star Industries Inc., Beulah, N.D.

Recent Developments in Drilling and Blasting Overburden

ARNOLD E. LAMM, Exec. Vice-Pres., Sunnyhill Coal Co., Columbus, Ohio.

Discussion:

GEORGE D. GRAYER, Sales Engr., Bucyrus-Erie Co., Milwaukee.

Maintenance of Strip Mining Equipment

WILLIAM C. M. BUTLER, JR., Vice-Pres., Central Pennsylvania Quarry, Stripping and Construction Co., Hazleton, Pa.

ROY M. LESENEY, Gen. Master Mech., Truax-Traer Coal Co., Canton, Ill.

7:00 P. M.—ANNUAL BANQUET

Presiding: **G. A. SHOEMAKER**, Exec. Vice-Pres., Pittsburgh Consolidation Coal Co.; National Chairman of Program Committee.

Another "speechless" banquet, with only brief introductions of honored guests, followed by a program of outstanding entertainment.

(Continued from page 50)

cinnati points of interest and the best places to shop will be there at all times to assist the visitors.

Entertainment Tops

An outstanding entertainment program has been arranged for the Convention. "Back to the Music Hall" will be the cry Monday evening as the American Mining Congress returns, after an absence of several years, to the Topper Club at Cincinnati's famous Music Hall for the Coal Miners Party. An informal cocktail hour will be followed by a good dinner and an evening of dancing and fine entertainment.

Baseball night, another traditional fixture

of the Cincinnati meeting, is set for Tuesday, May 8. Mining men and their ladies will troop out to the Ball Park to see a major league game between the Cincinnati Red Legs and the New York Giants. A special American Mining Congress section has been arranged for. Come early and see any friends you might have missed on the Convention floor.

To make sure of getting seats with friends, applications for tickets should be sent promptly to the Cincinnati Baseball Club, 307 Vine St., Cincinnati, Ohio. Be sure to ask for seats in the Mining Congress section.

The 1956 version of the annual "Speechless" Banquet will again be held in the glitter-

(Continued on page 58)

Program Committee

E. B. Ages Indiana Coal Operators Assn.	Shelly C. Hughes Differential Steel Co.	V. D. Picklesimer South East Coal Co.
Clayton Ball Paul Weir & Co.	E. H. Johnson Kennametal Inc.	E. R. Price Consultant Frederick, Md.
C. E. Boton Joanne Coal Co.	C. W. Jones Amherst Coal Co.	J. D. Reilly Hanna Coal Co.
C. R. Bourland The New River Co.	R. D. Ketner General Electric Co.	L. J. Richardson Harman Mining Corp.
J. A. Brookes Pickands Mather & Co.	A. E. Long Bradford Coal Co.	G. E. Sorenson Kemmerer Coal Co.
J. R. Carridge Cincinnati Mine Machinery Co.	Gordon MacVean National Mine Service Co.	J. A. Stachura Enco Collieries, Inc.
E. F. Curtis Pardee & Curtis Lumber Co.	H. C. McCollum Peabody Coal Co.	C. E. Tieche Clinchfield Coal Corp.
J. B. Dempsey Puttin Mfg. Co.	R. R. McCracken Quaker Rubber Corp.	Richard Todhunter, Jr. Barnes & Tucker Co.
W. P. Dickson Ensign Electric & Mfg. Co.	Edward T. McNally McNally-Pittsburg Mfg. Corp.	G. H. Utterback United Electric Coal Co.
J. E. Elkin Duquesne Light Co.	W. E. Mullins Midland Electric Coal Co.	Charles Vignos, II American Mine Door Co.
R. W. Fox Powhatan Mining Co.	W. J. O'Connor Independent Coal & Coke Co.	A. J. Walker Slab Fork Coal Co.
C. A. Gibbons M. A. Hanna Co.	C. Lynn Peterson Peterson Filter & Engineering Co.	H. B. Wickey Lehigh Valley Coal Co.
James C. Gray U. S. Steel Corp.	E. B. Philipp Dan Truck Co.	J. E. M. Wilson Jeffrey Mfg. Co.
Cecil M. Guthrie Sinclair Coal Co.	E. R. Phillips Lee-Norse Co.	H. O. Zimmerman Inland Steel Co.
George C. Holton American Cyanamid Co.		



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*American Car Foundry Division
ACF Industries, Inc.
Allegheny Ludlum Steel Corp.
Allen-Sherman-Hoff Pump Co.
*Allis-Chalmers Mfg. Co.
Alloy Steel & Metals Co.
American Air Filter Co., Inc.
American Brattice Cloth Corp.
*American Manganese Steel Division
 American Brake Shoe Co.
 American Chain & Cable Co.
*American Cyanamid Co.
 American Mine Door Co.
 Anaconda Wire & Cable Co.
 Armstrong Coalbreak Co.
 Atlas Copco Eastern, Inc.
 Atlas Copco Pacific, Inc.
*Atlas Powder Co.

Baldwin-Lima-Hamilton Corp.
 Lima-Hamilton Division
Barber-Greene Co.
Bearing Service Co.
Bethlehem Steel Co.
Bird Machine Co.
Bixby-Zimmer Engineering Co.
Bowdil Co.
Broderick & Bascom Rope Co.
Brooks Oil Co.
Brunner & Lay Rock Bit Corp.
Bucyrus-Erie Co.

Carboloy Department
 General Electric Co.
Card Iron Works Co., C. S.

* Charter members.

Cardox Corp.
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Cummins Engine Co., Inc.

D-A Lubricant Co., Inc.
Deister Concentrator Co., The
Deister Machine Co.
Differential Steel Car Co.
Dings Magnetic Separator Co.
Dorr-Oliver, Inc.
Dow Chemical Co.
Duff-Norton Mfg. Co.
*Du Pont de Nemours & Co., Inc., E. I.

Easton Car & Construction Co.
*Edison, Inc., Thomas A.
Eimco Corp.
Electric Steel Foundry Co.
Electric Storage Battery Co.
*Ereco Corp.
Engineers Syndicate, Ltd.
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*Enterprise Wheel & Car Corp.
Equipment Engineers, Inc.
Euclid Division
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Fairmont Machinery Co.
Femco, Inc.
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Firth Sterling, Inc.
Fletcher & Co., J. H.
Flexible Steel Lacing Co.
Flood City Brass & Electric Co.

Gardner-Denver Co.
*General Electric Co.
*Goodman Mfg. Co.
Goodrich Co., B. F.
Goodyear Tire & Rubber Co., Inc.
Gorman-Rupp Co.
Gould-National Batteries, Inc.
Guyan Machinery Co.

Harnischfeger Corp.
*Hendrick Mfg. Co.
Hendrix Mfg. Co., Inc.
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*Hercules Powder Co.
Hewitt-Robins Incorporated
Heyl & Patterson, Inc.
*Holmes & Bros., Inc., Robert
Hughes Tool Co.

- *Hulbert Oil & Grease Co.
Humphreys Investment Co.
- *I-T-E Circuit Breaker Co.
Ingersoll-Rand Co.
International Nickel Co., Inc.
Interstate Equipment Division
Yara Engineering Corp.
Irwin Foundry & Mine Car Co.
- *Jeffrey Mfg. Co.
Johnson-March Corp.
*Joy Mfg. Co.
- Kanawha Mfg. Co.
Kansas City Structural Steel Co.
Kennametal Inc.
Kensington Steel Co.
Koehler Mfg. Co.
- Lake Shore Inc.
Lee-Norse Co.
Le Roi Division
Westinghouse Air Brake Co.
- *Leschen Wire Rope Division
H. K. Porter Co., Inc.
LeTourneau-Westinghouse Co.
- *Link-Belt Co.
Long Co., The
Longyear Co., E. J.
Ludlow-Saylor Wire Cloth Co.
- *McGraw-Hill Publishing Co.
McLanahan & Stone Corp.
*McNally-Pittsburg Mfg. Corp.
- Mack Motor Truck Corp.
Macwhyte Company
Manu-Mine Research & Development Co.
Marion Power Shovel Co.
Mechanization, Inc.
- *Mine Safety Appliances Co.
Mine & Smelter Supply Co.
Mining Machine Parts, Inc.
Mosebach Electric & Supply Co.
Mott Core Drilling Co.
Murphy Diesel Co.
*Myers-Whaley Co., Inc.
- Nachod & United States Signal Co.
National Electric Coil Co.
National Malleable & Steel Castings Co.
National Mine Service Co.
Nolan Co.
Nordberg Mfg. Co.
Northwest Engineering Co.
- *Ohio Brass Co.
Ohio Carbon Co.
Okonite Co.
Hazard Insulated Wire Works Div.
Olin Mathieson Chemical Corp.
Osmose Wood Preserving Co.
- Page Engineering Co.
Pattin Mfg. Co.
- Penn Machine Co.
Peterson Filters & Engineering Co.
Pioneer Engineering Works, Inc.
Pittsburgh Screw & Bolt Corp.
Post-Glover Electric Co.
Productive Equipment Corp.
Prox Co., Inc., Frank
- Quaker Rubber Corp.
- Raybestos-Manhattan, Inc.
Reich Bros. Mfg. Co.
Reliance Electric & Engineering Co.
Republic Rubber Division
Lee Rubber & Tire Corp.
- *Roberts & Schaefer Co.
Rock Products
- * Roebling's Sons Corp., John A.
Rome Cable Corp.
- *S K F Industries, Inc.
Salem Tool Co.
Sanford-Day Iron Works, Inc.
Schroeder Brothers
Sheffield Steel Division
Armco Steel Corp.
- *Simplex Wire & Cable Co.
Simplicity Engineering Co.
Southwestern Engineering Co.
Sprague & Henwood, Inc.
Stearns Magnetic Inc.
Stearns-Roger Mfg. Co.
Sterling Steel Casting Co.
Sun Oil Co.
- Talcott, Inc., W. O. & M. W.
Tamping Bag Co.
Texas Co.
Thor Power Tool Co.
- *Timken Roller Bearing Co.
Tool Steel Gear & Pinion Co.
Tracy Co., Bertrand P.
Traylor Engineering & Mfg. Co.
- *Tyler Co., The W. S.
- Ultra Violet Products, Inc.
Union Iron Works
Union Wire Rope Corp.
- *United Engineers & Constructors, Inc.
U. S. Rubber Co.
*U. S. Steel Corp.
- Varel Mfg. Co.
Vascoloy-Ramet Corp.
Victaulic Co. of America
Vulcan Iron Works
- Wedge Wire Corp.
Western Machinery Co.
Western Precipitation Corp.
Western Rock Bit Mfg. Co.
- *Westinghouse Electric Corp.
West Virginia Steel & Mfg. Co.
White Motor Co.
Autocar Division
Winter Weiss Co.

★Entertainment★

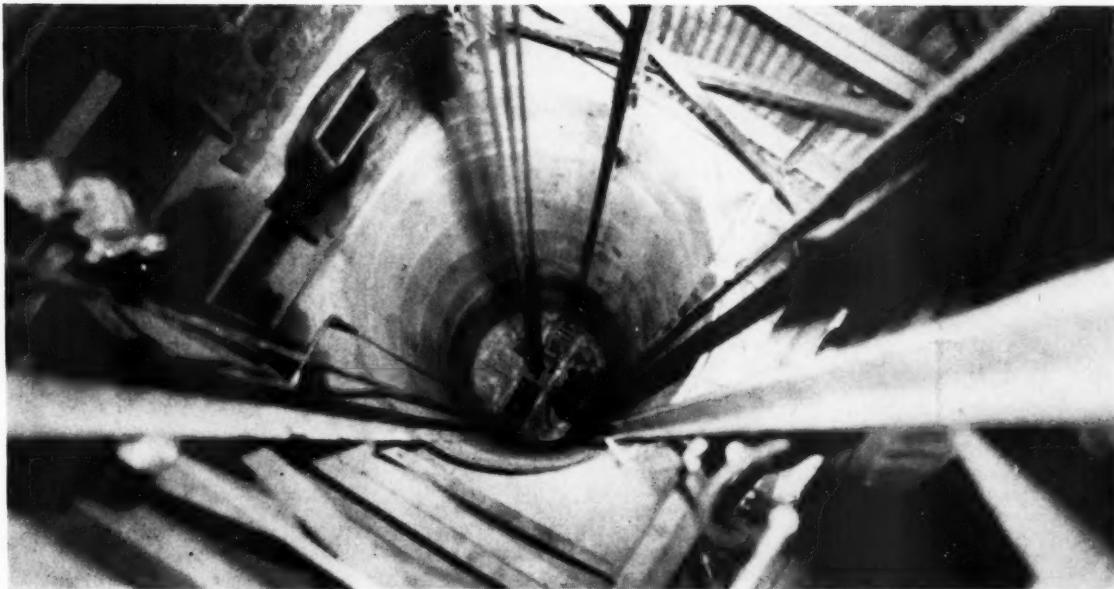


ing Hall of Mirrors at the Netherland Plaza. After dinner there will be a three-point entertainment specialty—"Spain's Royal Family of Comedy," a surprising pantomime musical act; Estelle Sloan, sensational and sprightly dance artist; and Arthur Lee Simpkins, world-famous tenor who captivated the 1954 banquet crowd and who is appearing again by popular demand. As usual, the dinner will be informal. There will be no speeches, only brief introductions of the honored guests. All tables are reserved.

All indications point to another "record-busting" week. A truly great program, an outstanding array of entertainment and the "pull" of meeting old friends and making new ones make the 1956 Coal Convention one no mining man will want to miss.



See you in Cincinnati at the Coal Convention, May 7-9



Completed 6-ft diameter circular shaft, over 500 ft depth, with guides installed and arranged for hoisting and lowering men in a two-deck cage

New Equipment for Underground Mining

- Six Foot Rotary Drill for Shaft Sinking
- Cryderman Shaft Mucker
- Multiple Car Full-Train Loader

THREE new mining machinery developments have shown up recently. These are witnessing rapid improvements, and the applications are increasing.

Two of these machines have passed beyond the working model stage and are moving into the production field with strides and performances that are most interesting. The third machine was developed to be operated in a tunnel or mine drift heading in

conjunction with a newly developed air-operated crawler type loader. One phase of the development utilizes an idea that was tried in an experimental machine over 20 years ago. This combination of machines is in use, and, aside from a few minor headaches and operating bugs, has the possibility of changing the standard accepted practices so long followed in the driving of underground drifts, cross cuts and tunnels.

ZENI SIX-FOOT DIAMETER ROTARY DRILL

Numerous are those who at one time or another, when trying to obtain speed in driving a development drift, cross cut, or vertical exploratory opening, wished for the day when it would be possible to perform the entire operation with a self-contained

machine and the entire bore could be extracted in one chunk or in a continuous non-stop cutting operation. The day, particularly as far as vertical shafts are concerned, may be approaching when this becomes an actual reality. During the last couple

By ROGER V. PIERCE
Consulting Engineer
Salt Lake City

of years there has been a development under way with a new approach that may ultimately be the answer to solving this problem.

Five men, of whom four are brothers, operated a shaft contracting company located in the coal fields of West Virginia under the leadership of Victor Zeni. In carrying out their contracting business they recognized the need of the industry for a machine to drill large bore holes. This group, composed of an electrical superintendent, a mechanical superintendent, a mine superintendent, etc., combining their talents and shaft sinking experience, reviewed what had been done to date in the field of drilling large bore holes and came up with another approach to the problem.

Features of Zeni Drill

The field of drilling large holes—three feet in diameter and larger—has been limited to the massive rotary drill that utilized chilled shot as the drilling or cutting medium. These machines, with the driving mechanism located over the collar of the hole, controlled the drilling through a drive shaft connecting the driving mechanism to the rotating element in the bottom of the hole. This equipment,

developed in past years for mining application, was most popular for drilling large underground holes from one level to another. Often these were sunk ahead of the development on a new level in order to have a ventilation shaft completed ahead of the new level development work. The idea was successful, but the over-all cost and the performance limited the scope of the machine. The idea never became too popular. A few specialized applications still require use of these machines.

The main differences between this machine and the machine being developed are: (1) on the new machine the driving mechanism is designed as an integral part of the drilling or rotary cutting apparatus; (2) the entire unit is powered by an electric motor that furnishes hydraulic power for all phases of the operation; (3) the entire unit is lowered directly into the bottom of the hole; (4) the operator dur-



The complete machine with platform for operator, driving mechanism, core barrel and rotary bits

ing drilling is stationed on the drill; and (5) the essential difference in this development, and the idea that may be the cause of revolutionizing the entire concept in drilling these larger holes, is that this machine is equipped with tri-cone or oil well type drilling bits on the cutting head. Twelve to 14 of these rotary bits are equally spaced around the circumference of the cutting edge of the massive bit head. These rotate as the main driving cylinder is rotated. As they rotate, they cut a circular channel four in. wide, and the six-ft diameter core is enclosed by the drill cylinder.

It was known that for this type of cutting bit to be successful the speed of cutting depends upon the amount of pressure that can be exerted on the

rock face through the bit and the degree to which the rock face can be kept clean of cuttings. If cuttings are allowed to build up between the bit and the cutting face, drilling efficiency, due to cushioning, drops off. It is necessary to keep this contact clean at all times and not let the drill residue, either wet or dry, build up in the circular channel. In order to remove these cuttings by positive action, a flexible rubber tube was installed on each side of each cutting bit (part of a set of tri-cone bits). It was arranged so that air or water could be forced through one hose and the dry cuttings or water-bound sludge could be removed by vacuum through the alternate suction hose and the cuttings pulled up into a chamber.

Future Effect

This machine has completed its second six-ft diameter hole to a depth of approximately 500 ft. These holes were drilled through surface residual soil, sandstone, shale and limestone. They were drilled to be used as main service shafts for a large, operating coal mine. The men who developed this machine contracted the drilling at \$45.00 a foot for the six-ft diameter hole, plus the bit costs which amounted to approximately \$6.00 a foot. The day I observed this machine in operation it drilled and completed eight ft of hole in eight hrs. The machine is now drilling on the third hole.

With some imagination it is possible to visualize its future as having a far-reaching effect on the industry. It is possible to foresee, from results so far obtained by this machine—powered at present by a 25 hp electric motor—that by increasing weights, experimenting with higher pressures and using a much larger motor, it may be possible to increase the diameter



Pulling core from the shaft with core wedged into the opensided cage

of the holes. Also, it is possible that two holes of this type could be drilled adjacent to one another, and these two compartments, both of large diameter, could be put down without rupturing the wall rock next to the openings. The service for which some of these particular holes were drilled is in itself quite unique. One of the first, if not the first, circular shaft drilled with a large rotary drill was used for the hoisting of men into and from an operating mine by automatic remote controls and without a hoist man or cage tender.

The accompanying illustrations give the various views of the machine and particulars of the completed shaft.

In one instance, a friction type hoist



Close-up view of the rotary type bits located on the circumference of the drill shell

is mounted in the structure above the shaft for servicing a double deck circular cage. Each compartment of the cage has a capacity of 10 men, and both the top and lower decks are loaded and unloaded simultaneously from a two-deck platform located underground and on the surface. The hoist is automatically controlled. The hoist control is attained through push-button operation from the cage and is amply protected by precautionary safety devices. These mancages are

fully automatic and complete with:

1. Pushbutton control panel inside cage (both levels).
2. Door controls—limit switch operated. Cage won't move as long as door is open.
3. Landing door controls.
4. Safety escape hatches.
5. Multiple cables, spring mounted.
6. Tool steel wedge type safety dogs.
7. Steel rail guide.
8. Hoist controls, counterweight and wedges.

CRYDERMAN SHAFT MUCKER

(Canadian Development—Patented U.S.A.)

A development originating in Canada that may have a far-reaching effect on the future practices of shaft sinking is a machine that has been evolved within the past three years. Up until the first of 1955 two models of this machine were in use in the vertical shafts of Canada.

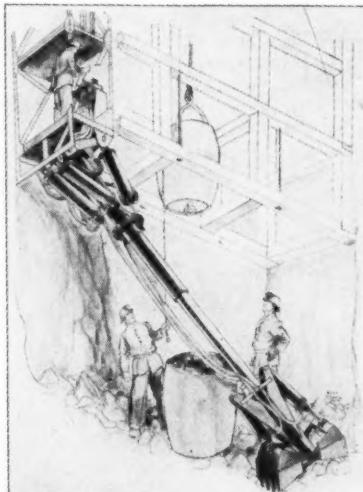
A development originating in Canada and that already has had a far-reaching effect on the future practices of shaft sinking is a machine that has been evolved within the past three years. Up until a year ago only two of these machines were in use in vertical shafts in Canada. Today there are 29 machines operating in the provinces from Nova Scotia to British Columbia. In addition to this, an American company now manufacturing these machines has one sinking a deep shaft for a western copper mine. The first of these shaft muckers, an experimental model, was brought into the States and completed a shaft job in Montana.

Handles Coarse Rock

In the experimental model a great many difficulties and time delays were encountered. There has been more than the normal run of bugs that had to be worked out after the machine passed from the hands of the designer-operator into the hands of green men. On top of this, there has been difficulty in sinking down through blocky granite. Parting seams of two to three in. of soft talky material separated these blocks, and it has been almost an impossibility to break this with any degree of fragmentation without heavy secondary blasting. This has been the case regardless of the number of holes, type of cut, the amount or percentage of powder, or whether or not standard electric or milli-second delay caps were used. For the first 150 ft of shaft almost one-half of the rock in the muck piles was of a size that was too large to be handled by hand. This machine has demonstrated that it will handle material of a size no other type loader built to date could pick up and load.

This particular unit was a small

model machine. The main cylinder on the extension boom was small in diameter, and the bucket had a capacity of roughly a quarter yard. Production machines, both in Canada and the United States, are being manufactured of heavier construction and



Operator in the cage with the two joystick levers that manipulate the multiple directional valves. This controls the entire mucking operation of extending the boom, moving it anywhere in the shaft bottom and opening and closing the clam bucket

improved design with a much larger and more rugged main cylinder and a three-eighths or one-half yd clam bucket.

In this machine the designer has developed a new mechanical action, and the approach is one which through its simplicity of operation and general over-all adaptability will fit any of the standard rectangular shafts of two, three or four compartments. It will also fit into any other section, whether circular or square, and has application in almost any size shaft. However, in addition to this—and so far it has not been tried

—this machine has the possibility of being the first unit with features that will allow it to do what no other machine has done, and that is to load in steep incline shafts. As is well known so far, in the field of loading broken rock in an incline shaft, it has only been in the flatter inclines that the air-operated, compact type muckers have been successful or on slopes up to 30° that the three-drum slusher hoist has been fairly satisfactory. On inclines steeper than this, from 30° to just off vertical, there has been little in the way of machinery developed to perform the job. In sinking the steeper incline shafts hand mucking has not been replaced.

This machine, it is believed safe to predict, can be engineered to fit in and handle broken muck from any type incline or vertical shaft.

Basically, the machines now in use in vertical shafts are quite simple. They consist of a 20-ft cage that is built in two 10-ft sections for ease of installation. A gimbal type support is built into the cage bottom and, from it, the telescopic boom is mounted. On the front of the gimbal and at each side of the boom, two air cylinders are mounted that control the swing of the boom from side to side. This swinging distances of 14 ft to each side is desirous in mucking station cut-outs. Directly behind the boom, and to the back of the cage, are mounted two cylinders that control the raising and lowering of the boom. At the lead end or clamshell end of the boom two air cylinders actuate the two clamshell jaws.

The main air-operated telescopic extendible boom delivers a positive loading and positioning of the bucket and a positive pressure at the point of digging. A cylinder within the boom permits an extension of 15 ft, giving the boom a total length of 32 ft. The retracted length is 17 ft.

The operator is located at the bottom of the cage where he works two operating levers while in full view of the shaft bottom. He is protected by the cage and never has to move into the hoisting area. Using seven cylinders, which are centrally controlled by these levers, he actuates the multiple directional valves that control the positive opening and closing of the three-eighths yd clam bucket and the rapid movement of the bucket back and forth to any spot in the shaft bottom.

The entire unit, in principle, could be compared to the action of a man's arm and hand. It is possible to reach in any direction, and the clam jaws can be opened and closed positively and rapidly. The boom extends out to place the bucket at any point in the bottom of the shaft. The positive action of the cylinders to the clamshell picks up the load to be raised and then dumps it into the shaft bucket. It is flexible enough that during the time

the extremely coarse muck was being handled the operator would pick up a boulder as large as one-half ton and drop it into the bucket. If the boulder was too large to go into the bucket, the machine would again pick it up and set it to one side. Usually in so doing the bucket would be tipped over. The machine would take hold of the bucket, set it upright and move it to the required position in the shaft bottom.

The unique feature of the machine is that it requires no support other than the regular guides in the shaft. It is raised and lowered as simply as you would raise any cage in a shaft. To place it in operation the machine is lowered to the mucking position and a chain placed around a shaft post and one of the steel upright corners of the cage. The air hose is quickly attached to the machine, and from the time the machine is dropped to the mucking position not over three minutes elapse before the muck is being loaded. When the mucking cycle is completed, the unit is raised up the shaft, and there is no time expended in moving the unit from one point in the shaft to another.

Two methods of handling the mucker in the shaft may be employed: One

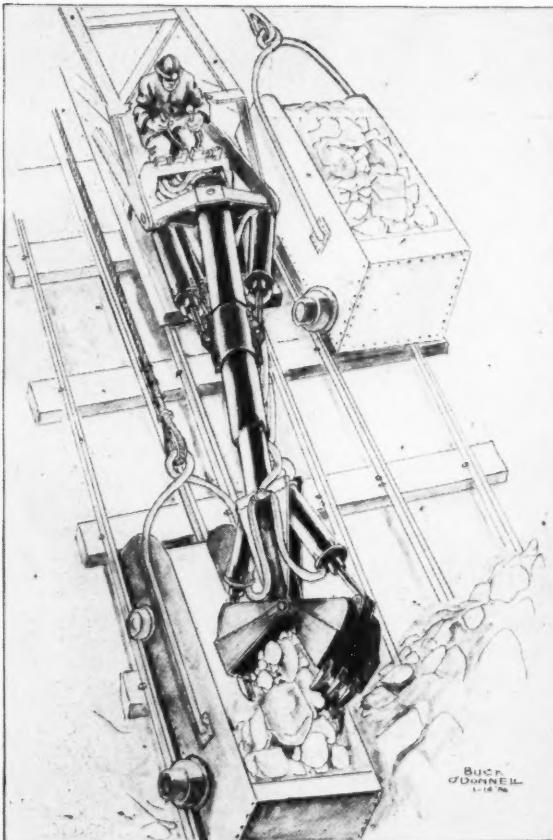


Surface waste dump shows size and number of boulders encountered throughout the sinking operation

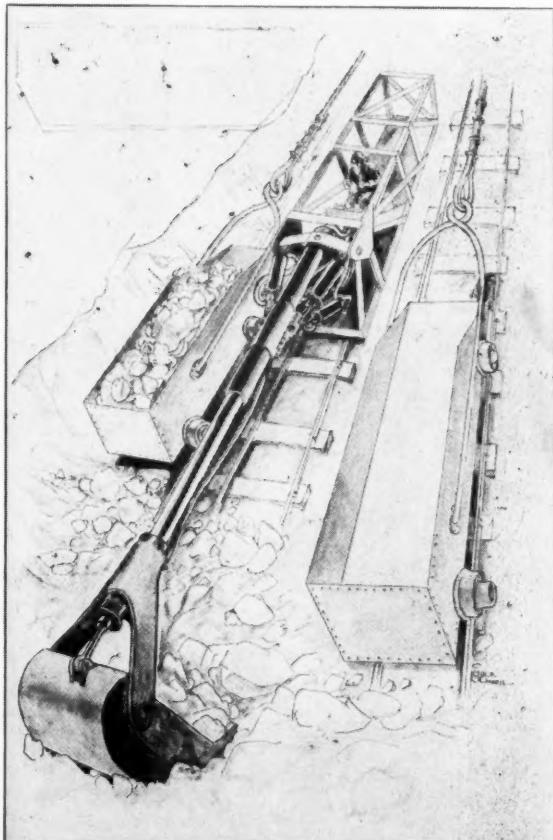
is a direct connection to the hoisting cable whereby the machine is hoisted to surface or an intermediate level before the blast; the second is to mount a tucker hoist in the cage above the operator, and, by double blocking, he can raise or lower the unit as he so desires. When using

this method, safety chains are attached to the mine timber when the mucker is not being hoisted or lowered.

The machine also has the facility of being readily applicable where ground conditions are extremely heavy and it is necessary to carry



Type of machine designed for use in incline shafts. It employs the same basic principle of gimbal bracket and telescopic boom as the vertical machine. Both clam bucket and backhoe type are shown



timber close to the bottom. This will operate with the timber as close to the bottom as blasting will allow. In order to operate this when the timber is close to the bottom, it is necessary to temporarily leave out two of the lowest dividers.

The machine eliminates the need of

THE WHUP D'WHUP—A FULL TRAIN LOADER

One of the earliest developments of mechanical mucking in drifts and other openings being driven for haulage was the introduction of scraper ramps equipped with two-drum slusher hoists. At first, cars were loaded individually, but as the use of the slusher ramps continued, several ideas were advanced to speed up the mucking cycle by the trial of various innovations involving multiple car loading. Some of the methods used were the wheel-mounted loading ramp, a long conveyor belt that extended the full length of the train, and a steel ramp so designed that the scraper pulled the muck up the ramp and distributed it to the several cars of the train.

Slusher ramps with their widespread wings that guided the scraper into the ramp were quite large and cumbersome. The use of this machine required a slow, time-consuming installation job. To obtain production, it was necessary to build these ramps to nearly full drift size, and it was difficult to pass the loader with materials or supplies. In addition to the time-consuming job of moving the slusher ramp free of the blast and back to the face, there was always the job of hand mucking out the sides and final cleanup of the face. The scraper simply cut a slusher lane through the muck pile and did not prove to be too maneuverable on cleanup work.

Rocker Type Machines

Slusher scrapers in headings proved non-competitive after the introduction of the track-mounted rocker type mucking machine. Advancing on slide rails, the compact mucker completely cleaned the heading, and, as it was track mounted, it was easily moved in or out of the working face.

Because of its rapid rate of mucking, it soon became apparent that servicing the loader with cars was the major time-consuming problem in attaining advance. Time studies demonstrated that a car could be loaded in a fraction of the time consumed in switching cars. To overcome this, many methods of increasing the speed of the mucking cycle were forthcoming, and "cherry pickers," "California switches," and car-transfers were all tried. Yet, in all of these innovations delays occurred during the time these units were being installed or moved ahead to a new position.

cables or sheaves, and instead of gravity, the air cylinders provide positive power in loading the clam bucket. It is felt that the machine will see increasingly more application throughout the industry, both in vertical and incline shafts of almost any size or shape.

deemed it necessary to carefully consider each and every idea adopted to gain the highest possible efficiency in driving haulage and exploration headings.

A thought advanced, and one that the supervisors of San Francisco Chemical Co. felt worthy of exhaustive study, was the adoption of a multiple train of cars incorporating several features:

1. Train of cars with capacity sufficient to move a complete round of muck from a heading round in one trip.

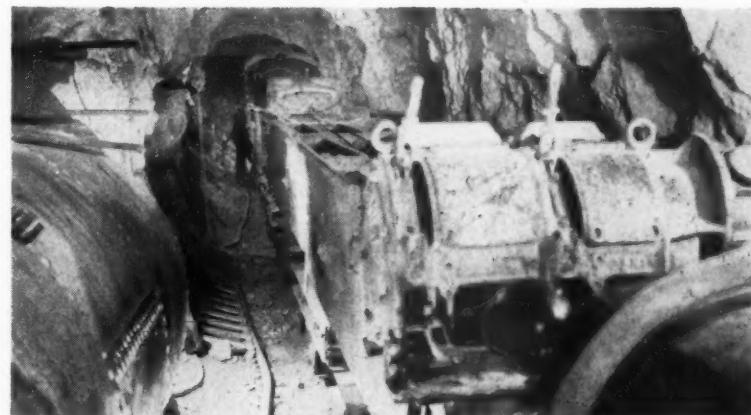
2. This would be equipped with a slusher hoist, scraper, etc., that were known to be fairly trouble-free, inexpensive and easy to operate and arranged to rapidly move the muck from the lead end of the train and distribute the material to all cars of the train.

3. It was to be simple to operate and one that required no setting-up or tearing-down time.

Shortly after the new installation was placed in operation, one of the miners, noting how rapidly the mucking machine was discharging muck



A completely self-sufficient loading and haulage unit—consists of a rail-mounted, overshot, air-driven mucking machine; string of integrated cars; slusher hoist and bucket



Integrated train car loader (locally named the Whup d'Whup) shown in operating position. The loader is at the drift heading, and the scraper is pulling muck into the empty cars toward the locomotive. (Engineered by R. B. Austin, Coeur d'Alene Hardware & Foundry Co.)

into the front car of the train and how quickly the scraper picked up a load and pulled it back over the train, announced that it really "whups" it in. From then on the multiple train of cars became known as the Whup d'Whup.

Complete Train Unit

The multiple train of cars goes into the heading as a complete unit, with the mucking machine, train of cars, slusher hoist and scraper all moved together. When the train is moved in or out of the heading, the slusher block bridle is lowered to the horizontal position. The slusher operator tight-lines the scraper and in so doing raises and locks the slusher block bridle in position. This is all the set-up required before starting the mucking transfer operation.

As quickly as the mucking machine drops the rock into the front car of the train, it is pulled back over the grizzly rails by the scraper. With a 20-ft capacity, as compared to the eight-ft capacity of the mucking machine bucket, it becomes necessary for the scraper to make two or three passes before picking up the full load to be moved to the other cars.

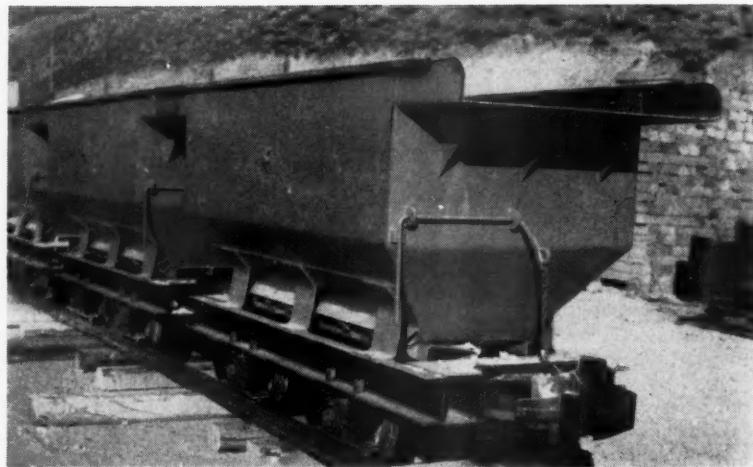
The fast rope speed of the slusher gives a rapid movement to the large scraper as it moves back and forth over the rail grizzlies of the multiple train. Synchronized with the fast discharge rate of the mucking machine, the operation of the Whup d'Whup results in rounds being mucked out in rapid order. With a continuous flow of rock from the muck pile into the cars of the multiple train, the time for mucking out the round is determined by how fast the mucking machine can deliver rock into the front car. In the first car of the train, the rail grizzlies are sloped. This gives "pocket" room above the rails at the discharge point of the mucking machine.

The slusher operator, with the hoist mounted on the rear car, has full view along the length of the train. The scraper moves back to the bridle of the front car where it raises and drops into the muck and, when loaded, is moved toward the empty cars of the train.

As the scraper moves along with its load, the rock drops into each car through the rail grizzlies until every car is filled to the rails. From the rails to the top of the cars there is a depth of 12 in. which serves as "side boards" for the scraper and keeps any loose rock from dropping from the train. The 42-in. scraper sliding through the cars creates in appearance a tailor-made slusher lane.

Excess Muck

Oftentimes slough muck from the back or sides or overbreak may mean an excess of muck in the round. To allow for this condition, the slusher



5½-ton bottom dump car—showing general construction and overlapping apron on the cars. (Manufactured by Coeur d'Alene Hardware & Foundry Co., Wallace, Idaho)

operator, after filling the train to the rails, proceeds to fill or stack each car above the grizzly rails to the top. This additional car capacity takes care of any excess muck.

On completion of the mucking operation, the dogs holding the slusher bridle are released, and the bridle is lowered to the horizontal position. The mucking machine and locomotive are hooked to the train, and the entire unit moves to the dump area.

Greater use of this multiple car train means that improvements and refinements will be made, among them the idea of having the slusher operator control his slusher from any point along the train by the use of a remote control switch. Also from this switch he could control the movement of the locomotive. Moving the locomotive forward as the mucking machine advances into the pile would reduce the travel distance of the loader from the pile to the first car. With the mucking machine operator

and slusher man together there would be better coordination in the loading of the train.

In any proposed project where the Whup d'Whup is to be used the cars should be built to utilize the full size of the cross section of the heading. This would simply mean a larger capacity car, fewer cars in the train and a reduced slushing distance.

After the heading projects have all been completed, the train-car-transfer machine (as it is made up entirely of standard cars and slusher hoist) can be separated with the cars used in haulage and the slusher being transferred into stoping work.

There are a number of these units being engineered for other installations, and it is felt that this development will gain in popularity constantly. To sum up the Whup d'Whup, it may be described as a simple, portable scrap drift on wheels which well revolutionize the driving of drift and haulage openings.



Top view of the overlapping hinged cars showing scraper transfer travelway. Scraper is in the lead end of the train

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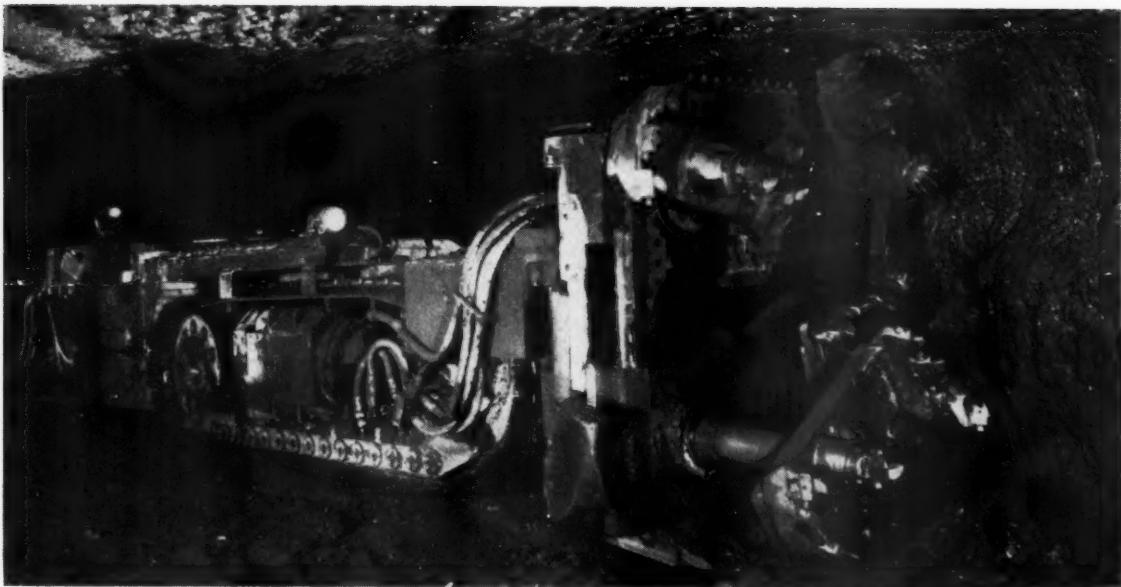
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Nearly half a million tons of coal have been produced by this machine; half of it from pillar recovery

Continuous Mining in Medium Height Coal

Analysis of Mining Delays During Six-Month Period of Three-Shift Operation With Boring Type Machine Shows Mechanical Failures Play a Very Small Part. Mining Conditions Are the Controlling Factor With Failures of the Mining System Next. Longwall Mining Could Be the Answer.

THE Redstone seam in the Buckhannon, W. Va., area is a hard structure coal with a definite face and butt cleat, lying about 30 ft above the Pittsburgh seam. It attains a thickness varying from 54 to 72 in. over our property. The immediate overlying strata is a gray shale, varying from three to 20 ft in thickness, which normally makes a very fine roof. Occasionally there is a "draw slate" of from six to 30 in. in thickness that may not be self-supporting over any important area. This must either be taken down as mining progresses or timbered before it has had a chance to "draw." In addition there are the same roof abnormalities that appear in all other seams. This includes "snap top," rolls, faults, "partings," etc.

Bottom consists of a very hard blue shale that is practically impervious to water. It is seldom completely smooth

By FRANK WILLIAMS, Jr.

General Manager
Pecks Run Coal Co.

and at times can be troublesome because of the rolls that penetrate into the lower part of the seam. The seam itself is clean with the exception of frequent pyritic sulphur inclusions and more or less frequent clay veins. Both can vary considerably in size and hardness. The sulphur may appear as balls or lenses in sizes ranging from very small, the size of the clenched fist, to very large, at times weighing hundreds of pounds. The clay veins appear at random, varying from a few inches to a few feet in thickness.

Work Machine Three Shifts

A Jeffrey Colmol was installed in March 1954. It was the intermediate model of the so-called "B" or large

machine. The mining range of this machine is from 50½ to 66 in., and as such will remove all but a small fraction of the tonnage in our acreage. Since December 1954, the machine has been on a five-six day week, three shifts per day schedule. We have mined over 400,000 tons of coal, half of which represents pillar recovery.

A section crew is comprised of a Colmol operator, loader operator, two shuttle car men, and three timber men. In addition, a belt maintenance man is assigned to the day shift, a ventilation man to the evening shift, and a supply man to the third shift. These men also act as substitute operators during the lunch period. The first two shifts are considered full production shifts and the third as a combination section maintenance, supply, and production shift. This crew takes care of the rockdusting, greasing, equipment maintenance, wire ad-

vancing, etc. They devote the remaining time to coal loading. This may be as little as an hour or as much as a full shift.

The only unusual duties in the foregoing system fall to one of the timbermen on each shift. His first duty relates to production in that he tends the Colmol cable by advancing the cable support jacks, thus keeping the cable clear of the loader as well as the rib and line timber. He also assists the operator in "styling" the machine as such becomes necessary in negotiating roof and bottom rolls. Time devoted to this work does not constitute an important fraction of his total work time, so he is not considered a Colmol helper, nor is it felt that one is necessary. His second and paramount duty relates to safety. At least in theory, the machine is continually advancing and therefore making new roof which must be subjected to the closest scrutiny both by visual and mechanical tests. This important job is performed by the foreman while in the working place, but it becomes the most serious duty of the timberman to take over the duty during any absence of the foreman. This system has succeeded to the extent that we have not had a single roof-fall injury on the Colmol section. The assignment is particularly important while the machine is on the rib line.

Job assignments are made on a dual basis. Applied to section labor, this means that each man has a specific duty during the mining time and another during the period of Colmol idleness. For instance, a loader operator assists in bit setting while the operators of the then idle shuttle cars assist the timbermen in a move up of roof jacks used for temporary roof support, and so on down the line with

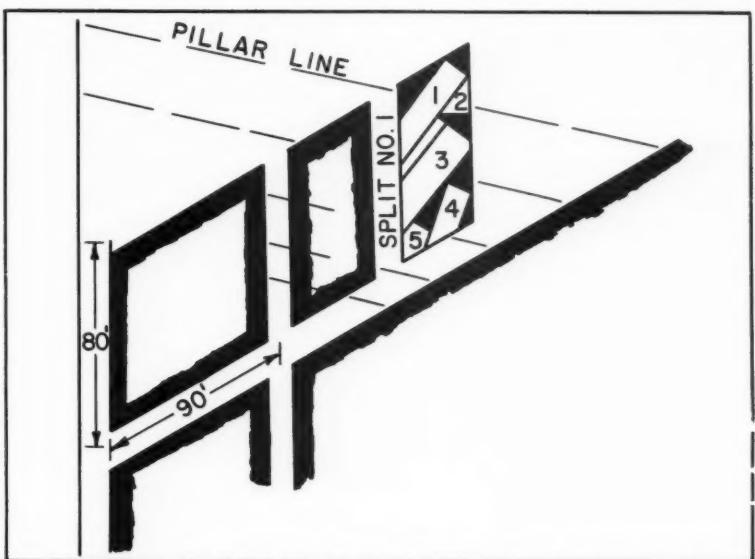


Fig. 2—Block pillar plan showing how splits are made and the coal that is left for protection

all other classifications, minimizing the need for direct orders from the section foreman in recurring situations.

Mining System

Panels are from 700 to 850 ft wide with three to five headings on 50-ft centers. Cross cuts are staggered on 80-ft centers in order to maintain air flow as near as possible to the rear of the mining machine. Rooms on one side are driven and pillared advancing. Rooms on the opposite side and chain pillars are mined retreating, thereby giving substantial tonnage per belt set up (see Fig. 1).

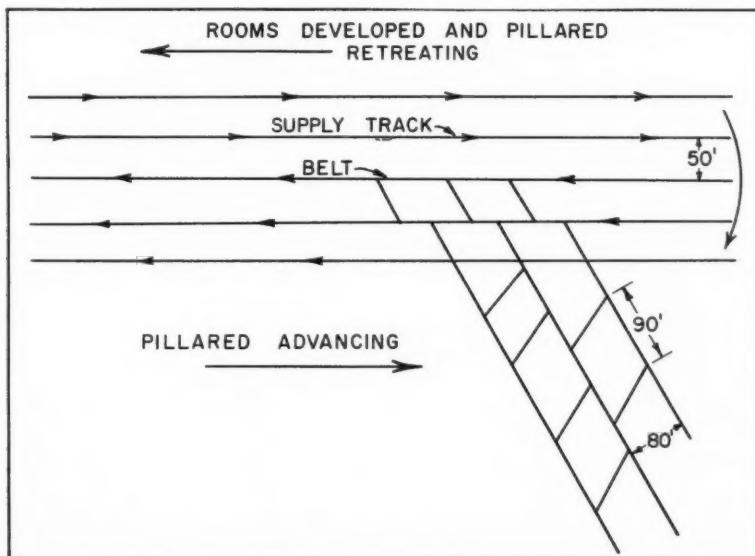


Fig. 1—Typical belt panel. The right side is mined advancing and the left side on retreat

We have settled on diamond shaped blocks constructed upon 60° angles. In advancing, it is advantageous, although not necessary, to ease the turning angle from the more or less conventional 90°. As a matter of fact, we do not feel that we suffer a tonnage loss due to cross cutting. In spite of its size, the machine performs remarkably well, even on angles considerably greater than the 60° we have adopted.

The greatest advantage of the 60° block accrues during pillar recovery. After a block is split the machine is brought part way back and driven toward the back of the block. Historically, this point has given difficulty to coal miners because of its position in the gob and its penchant for taking pillar weight. With continuous mining we are able to recover it with such rapidity that no problems are encountered. Due to the narrowness of the split and the position of undisturbed stumps on either side, any fall tending to ride over this point would not ordinarily cover the Colmol in any event. After a split is completed it is timbered before the next split is made. Small triangular stumps are left in retreating, the exact size being a matter of judgment based upon the operating circumstances. These are drilled and shot after the block has been mined (see Fig. 2).

In most cases these stumps could be removed with the splits. However, a mechanical or power failure could idle the machine in a pillar place with possible dire consequences. As it is, we feel that the roof is under almost complete control. Should, for one reason or another, it be desirable to preserve the mined out block for fairly long periods, the stumps can be left

intact and additional timbers set. After shooting, the fall usually comes during the time the first split is being driven in the next block. With respect to a given block in point of time, the longer pillarizing is carried on in any one room the less chances there are from a pillar fall because of the constantly reducing length of the exposed lip. At the time of actual stump removal, the length of lip from block to block is so short that major falls will not enter. We believe that the roof stability experienced in the mined out areas prior to making falls is because of the placement of the stumps. Multiple roof beam conditions are maintained in such a manner that no important weight will be cantilevered until we are ready for the fall.

Performance Data

The following presentation is based upon performance of the Colmol under conditions just outlined. Figures used for this purpose represent an attempt at full production during the period of April to December 1955. From actual tonnages the third shift fraction has been deducted inasmuch as it would distort the picture due to lack of full production time by virtue of collateral duties. This period covers development work only, so the per shift tonnages are smaller than would be expected had a portion thereof been pillar coal. During the period a full range of conditions was encountered, from the best to the worst. Sulphur and clay encountered during this period exceeded what would be the average for a like development footage over other parts of our property. For this reason the data can be considered as showing the pessimistic side, but that as a practical matter all mines face conditions as bad or worse than

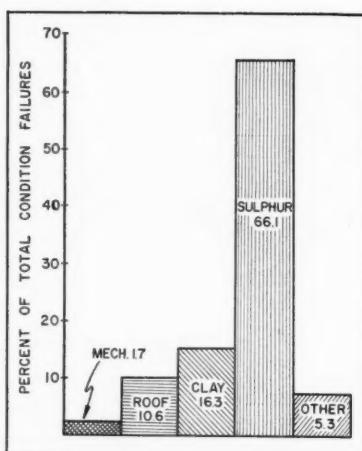


Fig. 4—Analysis of condition failures

those encountered at Peck's Run, and any new system cannot be fairly evaluated on the basis of its best performances only.

I am anxious to point out, however, that we consider continuous mining a most gratifying change over conventional methods, even in the face of the to-be-enumerated obstacles. I would further like to pay tribute to the machine itself for its dependability and durability. Machine failures do not constitute a significant part of lost time.

Figure 3 shows the per shift tonnage distribution in 25-ton increments during the period under discussion. This represents actual tonnages with no allowance made for short tonnage shifts other than those due to railroad car supply failure. In other words, shifts of short production due to the failure of car supply have been eliminated. Per shift production ranges

from a minimum of 25 tons on one occasion to a maximum of 600 tons on four occasions. Forty-three and a half percent of the shifts were within the target tonnage of 400 tons per shift. The target tonnage reflects a recognition of difficult mining conditions and is much lower than it might be under other circumstances.

The tonnage, or area under the graph, represents actual accomplishment and in one sense can be considered of only secondary importance. The big question mark is the area outside the graph which represents tonnage lost during the same period. The best shifts during this period were in the neighborhood of 600 tons. Since we have done no better, let's make the broad assumption, temporarily, that we can do no better. The hypothetical tonnage lying above the 600-ton line, therefore, was unobtainable because of some system failure or failures. Below this line, but above the production curve, lies the actual tonnage lost to the hypothetical maximum for one reason or another. Since such lost tonnage was evidently within the realm of attainment, it was lost because of a condition failure or failures.

Condition Failures

First let us analyze condition failures. Figure 4 was prepared from data gathered during the April to December period on stoppages. From this graph you can see that sulphur and clay veins account for by far the greatest production loss.

In comparison with conventional mining methods, delays from bad roof and timber setting have been reduced through the use of continuous mining. The absence of shooting with its consequent shock to the roof strata has improved conditions to the extent that marginal roof, which previously required timbering, is now good roof. Very bad roof, of course, must still be timbered.

Clay veins account for some tonnage lost. The big factor is that the material, even after removal, must be discarded. Other factors involved are roof unreliability adjacent to the clay veins, thrust faulted off sets, loss of seam height, and hard rolls, either top or bottom. In addition, bit changing time increases with the presence of clay.

System Failures

At the other extreme are the system failures that place a theoretical limit on the machine-shift productivity. Since it is the system at Peck's Run to haul coal with two shuttle cars a certain maximum distance, there is a system failure when the two cars, working within this limit, fail to carry the coal away, thereby forcing a shutdown of the mining machine. Since it is the system to furnish a certain

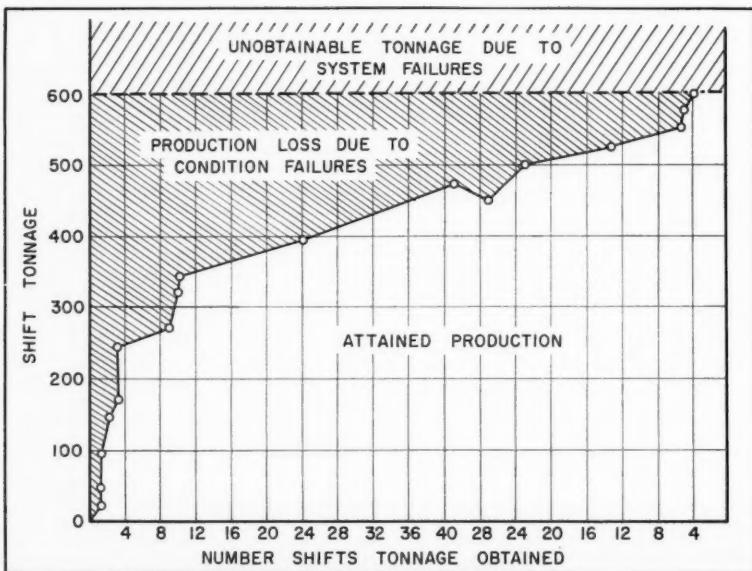


Fig. 3—Shift tonnage distribution. See text for details



With present day continuous mining systems there are inherent delays that longwall mining would eliminate

number of mine cars per hour to the Colmol section, a system failure occurs when that haulage capacity is even temporarily inadequate. Since it is the system to advance alternate sides of the working place with the Colmol, time lost in making the moves represents a weakness of the system. Over and above these, the tonnage limit that can be expected depends upon mining height and, most importantly, upon rate of advance. Evidently rate of advance is independent of cleat as we have obtained equally good shifts on all cleats. It also seems independent of the quality of hardness. The biggest factor while in clean coal seems to be the structure or "tightness." Some of our hardest coal is of a more or less open structure, thus giving high advance rates.

Other coal, although soft, seems to be structurally tight, resulting in poor advance rates. It is this factor, coupled with sulphur inclusions that may appear in a given area, that sets the limit on tonnage expectations.

Now what solutions are indicated to problems associated with condition failures? In the first place, modest increases are going to be realized through further development of carbide tools. However, there are certain basic limitations to this approach above and beyond the mere development of better carbides. Improvements are being made through a more general application of roof bolting and a less restrictive regulation of their use. Other gains can be made through the adoption of newer and better maintenance techniques and the

redesign of machinery and apparatus. However, we are still left with sulphur and clay, which, in our experience in the Redstone seam, are the big condition problems.

Is Longwall the Answer

As to system failure, we feel that a system is good as long as the actual shift tonnages obtained are less than the theoretical limit that could be expected. However, it does seem that there is one obvious path to really spectacular gains. This would be through the adoption of a mechanized longwall system. It would eliminate system delays of relatively low advance rates in tight coal by freeing it through longwall roof action; it would eliminate system delays brought about by trammimg from place to place and from room to room. It would minimize the condition difficulties with sulphur and clay in the same manner it minimizes the difficulty with tight coal in that inclusions would not be bound in the seam so tightly and therefore could be broken out as is now the case in our pillar mining. It could change our whole concept of timbering and continuous haulage. This, then, would be the ultimate in problem solution: a single answer for both system and condition difficulties. We are, therefore, examining this approach to continuous mining.

Finally, what has been done, good or bad, has been done with one of the finest labor forces in the industry. Their extra contributions through most difficult times prepared us for the better times ahead. Their suggestions have been utilized to the fullest, and I would like to acknowledge their help and thank them for it.

Split Robena Up

U. S. Steel's Coal Division has announced Frick District organizational changes in line with the development of its coal resources in that area. Under the realignment, the properties presently known as Robena Mine at Greensboro, Pa., will have four separate identities.

The Colvin Shaft's new designation is Robena Mine No. 1, Bowlby Shaft become Robena Mine No. 2 and Garard's Fort Shaft changes to Robena Mine No. 3. Also to be operated as a separate unit is the coal preparation plant at Robena slope.

With a capacity of 20,000 tpd and a 1954 production of 4,102,938 tons Robena was the world's largest coal mine. Until the recent expansion of production at the Climax, Colo., mine of Climax Molybdenum Co., it was the largest underground mine in this country.

M. B. Girod has been appointed an assistant general superintendent of the Frick District with responsibility

for the general supervision of all Robena facilities.

Appointment of superintendents for the three Robena Mines were announced at the same time. Robert Jordan will be superintendent of Robena Mine No. 1. He leaves Bridgeport mine in Brownsville, Pa., where he has been superintendent to assume his new post. J. P. Flynn, who has been superintendent of Palmer Mine at Ada, Pa., became superintendent of Robena Mine No. 2. Superintendent of Robena Mine No. 3 is J. W. Boyle, formerly superintendent of National Mine No. 3. John Durfee continues as superintendent of the coal preparation plant at Robena slope.

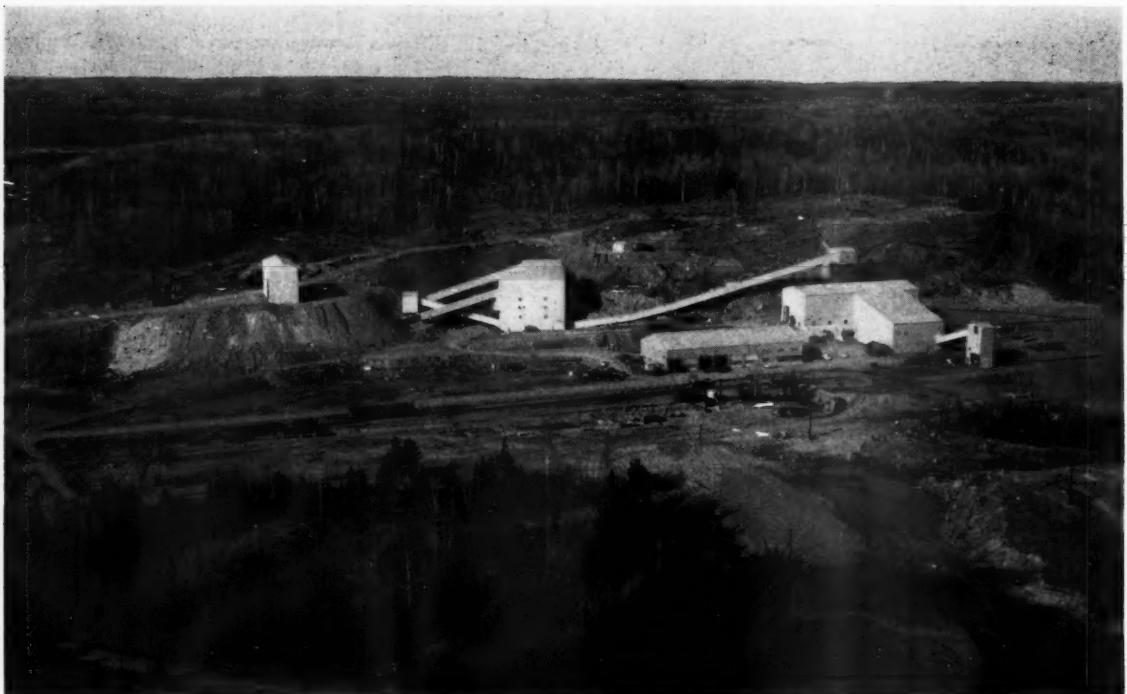
Succeeding Flynn as superintendent of Palmer Mine was D. H. Bayard, formerly assistant superintendent of Robena. New superintendent of Bridgeport, succeeding Jordan, is L. J. Callahan, formerly superintendent of Ronco Mine at Masontown, Pa.

Girod started his coal mining career in 1912 as a chainman in the Frick Coke Company's engineering department.

On January 1, 1948, he was named superintendent of Robena Mine, his position at the time of his present appointment.



"They don't dig coal like they used to . . . Thank goodness!"



Plant area of Michigan's first major iron ore development to produce concentrates from lean jasper

Primary Blast Hole Drilling at The Humboldt Mine

Jet Piercing Holds Promise of Solving a Major Operational Problem at Cleveland-Cliffs' New Low-Grade Open Pit Development. Tests With Rotary Drill Also Indicate Favorable Performance

By KENNETH C. OLSON

Cleveland-Cliffs Iron Co.

THE HUMBOLDT area of the Marquette Iron Range, located in the western half of Marquette County, Mich., was opened for mining in 1860 and worked by underground methods as late as 1920. The high grade ore, occurring in thin seams within a hard cherty iron formation, was for all practical purposes exhausted at this latter date, commencing a long period of mining inactivity in this area. In February of 1954, after two years of development and construction, the new Humboldt Mine, a joint venture by the Cleveland-Cliffs Iron Co. and the Ford Motor Co. involving an open

pit and flotation plant, produced the first high grade iron ore concentrates from these lean hard formations commonly called jasper. Since May of 1954 practically all primary blast hole drilling required at Humboldt has been accomplished by a jet piercing machine utilizing thermal energy to spall the rock-layers. During the last quarter of 1955, a test program involving a rotary drill rig, has also been under way at Humboldt.

This paper will consider practice and recent progress in primary blast hole drilling at the Humboldt open pit development involving experience

gained in both jet piercing and rotary drilling. It is not intended to discuss the mechanical features of the drill rigs or the basic theories of the drilling processes, but to present operational data accumulated to date and to outline techniques that have produced economical advancements in open pit mining.

Past Experience

Before considering Humboldt drilling in detail, however, it may be of interest to briefly describe earlier primary blast hole practice in the Marquette Range area as a guide to a better understanding of the drilling problems at the Humboldt Mine. Although the history of mining development on the Marquette Range over the past two decades is predominantly an account of progress in underground mining techniques and improved surface installations, hard ore open pit mines have been active in the area throughout this entire period. These mines, although limited in size, offered basic information to the planners of the Humboldt project on primary drilling, which was certainly the most critical factor in estimating the

possibilities of attaining an economical pit operation involving extremely hard formations.

These earlier open pit mines were confined throughout the years to the southeastern limits of the range, the product being a siliceous ore. The Tilden Mine, located south of Ishpeming, Mich., and operated by The Cleveland-Cliffs Iron Co., is typical of the pits in this area. Opened in 1929 and operated every season except 1954, the average annual production has been approximately 170,000 tons of siliceous ore crushed to minus 2½ in. Primary blast hole drilling during the life of the mine was accomplished by churn drills, the only significant variation being an increase in bit size from six-in. to nine-in. This change was pioneered in the area, as the first nine-in. blast hole in the Lake Superior region was drilled in 1937 at the Tilden Mine. The Tilden ore is usually classified as medium hard with average penetration rates by churn drilling consistently ranging from 18 to 20 ft per shift using bench heights of 65 ft. Bits used are of a plain carbon steel and present an average drilling life of five ft before sharpening is required. No special metallurgical processes beyond water quenching have been used for hardening the bits. This practice has proven the most satisfactory despite early attempts at using alloy bits and testing the jet piercing process.

In 1951, the Ohio Mine, a new open pit development and heavy media plant located at the western end of the Marquette Range, was completed by The Cleveland-Cliffs Iron Co. representing the first new open pit operation in this area since the opening of the Tilden Mine. This project



The jet piercing drill. Note the excessive rock fracturing

did not necessitate a variation in primary blast hole practice as the crude ore, a goethitic cherty iron formation, was not as hard as that at the Tilden. For the record, a churn drill in the Ohio orebody is capable of drilling at least 40 ft per shift with a bit life of 100 ft between sharpenings.

Tried Jet Piercing in '54

The opening of the Humboldt pit involved mining an extremely hard cherty hematitic iron formation that was specular in nature allowing it to be floated as a means of concentration. The annual tonnage of crude ore required at Humboldt was initially estimated to approach 750,000 tons per

year. Early testing with a churn drill using the standard techniques resulted in hole footages per shift of from one ft to six ft and a bit life of one to two ft between sharpenings. Subsequent experimentation with this rig also disclosed unfavorable results which eliminated this type of drilling for primary blast holes at Humboldt. The jet piercing process had been more successfully tested at Humboldt and the regular production rig was delivered to the mine in the spring of 1954.

Jet piercing at the Humboldt Mine, has been accomplished to date through the use of a drox liquid oxygen installation with a four-in. welded oxygen pipeline extending into the pit. Two and one-half-in. flanged feeder lines are tapped off from this main system directing the oxygen to points within the present mining limits of the pit, the remaining distance to the drill rig being covered by 1½-in. hose. Water is also piped into the pit, the fresh water source for the Humboldt flotation plant also providing the necessary gallonage for the jet. The third requirement for the process, dieseline fuel oil, in the case of the Humboldt operation, is conveyed to the rig by tank truck.

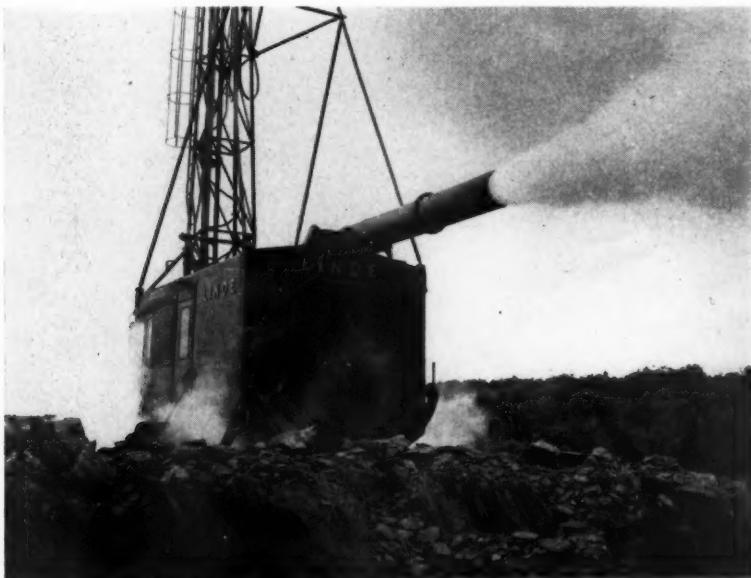
With this operating arrangement, a total of 36,650 ft of blast hole has been drilled in the hard formation at Humboldt. The detailed information resulting from this experience has been compiled and is presented in Tables I and II.

Penetration

Before discussing these details, it should be understood that this information reflects the use of a jet during the initial periods of developing the pit. Furthermore, the information is indicative of the possibilities of jet piercing in a pit development program representing extremes in ledge contours as well as severe natural jointing. Also to be considered are rock fractures and numerous shafts, winzes, and small pits caused by early mining activities, which have been a further hindrance to early development efforts. These conditions not only interfered with the moving of the jet, but piercing is always retarded when formations are not solid and uniform as spalling does not readily take place on sharp corners or acute angular areas.

A breakdown on penetration rates was made according to the type of material being drilled. This circumstance of having numerous types of material to drill has been of great importance at the Humboldt operation in influencing the extent of overall drilling costs.

As development of the ore body progressed, it became more and more evident that little homogeneity existed and that the mining area was made up of a series of geologic structures offering variations in the forma-



Penetrations as high as 20 ft per hr and averaging 14 to 15 ft per hr have been attained with this jet piercing drill

TABLE I—LINEAL PIERCING RATES

Rock Types	Speed (Ft. per Hr.)
Conglomerate	20
Lean Hematitic Iron Formation (Typical Jasper)	17
Argillaceous Iron Formation	14
Unoxidized Iron Formation (Iron Silicates)	15
Very Lean Magnetic Iron Formation	16
Diorite Dikes	12
Sericitic Dikes (Highly Altered)	9
Average Piercing Rate (Including Chambering and Cleanout)	11-12
Average Piercing Rate (Excluding Chambering)	14-15
Average Hole Size (Rated 6½ in.)	9-11 in.
Average Bench Height	34 ft
Average Hole Spacing	21 ft x 21 ft

TABLE II—TIME DISTRIBUTION

Operation	Percent of Total Available Shift Hours
Piercing	55.1%
Moving	13.0%
Delays	12.9%
Casing Holes	8.0%
Repairing	7.0%
Changing Reamers	2.8%
Cleaning Holes	0.8%
Changing Burners	0.4%
	100.0%

tion to be penetrated. The list of rock types is for the most part self explanatory, except perhaps the argillaceous iron formation. At Humboldt, this material is a slaty light-colored formation with the hematite being finely disseminated throughout, rather than occurring as the usual fine bands associated with the more typical formations. At the lower end of the piercing rates, are the igneous dikes, particularly those in a highly altered condition, which are by far the most difficult to pierce. Every effort is made to avoid placing jet holes in these structures when possible. In the case of small dikes that are unavoidable within the drilling pattern, it is essential that the chambered portion does not occur in the dike.

Since there is a slagging action in the hole instead of spalling, it has been found that by increasing the water rate from the usual 1000 gal per hr to 1200 gal per hr, the penetration is increased because of the added quenching effect to the rock. Also, it becomes necessary to often raise and lower the blowpipe as a constant aid in breaking through the melting ground. Increasing the oxygen flow rate from the normal 10,000 cu ft per hr to 11,000 cu ft per hr with a corresponding increase of fuel and water does not adequately increase the drilling speed in this material to justify the added cost.

Delays

In considering the time distribution of the jet piercing operation at Humboldt (Table II), it is obvious that two direct functions of the drilling procedure, moving and casing, plus delays and repairs, account for the bulk of the consumed time aside from that actually spent in piercing. The moving time (13.0 percent) required is because of difficult terrain, but it should decrease once adequate benches are established. This figure also reflects the rigors of winter operation—when smaller, more numerous blasts are fired. This will minimize the snow problem and frozen material difficulties in the crushing plant, but will cause additional moves to clear the machine from the blast area. However, the moving of a jet will always be somewhat slow and arrested by the oxygen line, water line, and power cable that must be guarded and coiled as the machine progresses. It is, therefore, sound theory and good economy to fire very large blasts when possible and to plan a minimum of moves between working faces. This is particularly true of a small operation where one jet piercer will handle drilling requirements.

As a sidelight to the economies of multiple row blasts, the rows occurring behind the holes along the crest of the working face are drilled with an increased piercing rate compared to the front holes because there is less fractured material in the area of the back holes. Also, excellent fragmentation occurs from these larger blasts, probably because of the attrition and impact of such large tonnages in motion.

Included in the 12.9 percent attributed to delays are other winter difficulties including the time consumed

by jet crews in moving oxygen lines to protect them from blasts. Another example was an instance when old mine workings were utilized as a source of water in an effort to reduce the length of supply lines. Immediately, burner trouble developed. Lengthy investigations disclosed that the burners were failing because soluble iron salts in the water from the mine workings were precipitating as they passed through the water ports of the copper burner. Such restrictions in the ports resulted in extreme temperatures within the burners—causing melting and erosion of the copper.

Starting Holes

The difficulties of starting a hole by jetting in broken ground is very critical at Humboldt and can at times reduce the over-all piercing speed for a hole by one-third. Larger spacing of holes through the use of chambering is, of course a commonly used aid in this problem. The situation is also tremendously improved by carefully preparing the hole site by scraping the area to clear away all loose material. This operation is efficiently accomplished through the use of a small bulldozer or by the jet helper with hand tools. An oxygen and acetylene burning torch, mounted on the machine, helps immeasurably in fitting the casing pipe to the hole that is developing.

Chamber Holes

On the average, the necessary repairs encountered on the Humboldt jet have been miscellaneous in nature and without any great consequence. Under normal conditions at least 2300 ft are recorded between burner changes and an average of 58 ft is drilled before a new reamer or hole

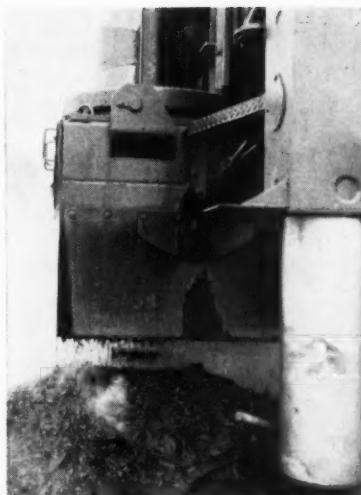


Pit view showing three work horses—a 34-ton truck, five cu yd shovel and jet piercing drill

sizer, which encloses the burner, is needed. The kelly, or blowpipe, usually receives a great deal of wear along the bottom six ft of the stem because of the abrasive effect of the discharging material. For this reason it is turned end for end after 4500 ft of drilling, meaning that the kelly has to be replaced and built up after approximately 9000 ft of piercing. The kelly extension, a short tubular piece between the main blowpipe and the burner, is replaced after approximately 3000 ft. The reamers and the kelly extensions are made at the mining company's general shops.

The chambering of holes is a great advantage gained by drilling with the jet piercer. In developing the many bank heights that have occurred at Humboldt during the initial development period, the approximate drill patterns shown in Table III have been used, with depths in all cases being extended four ft below the required grade.

When conditions allow the use of a chamber 8 ft in length, the tonnage broken per hole has been increased up to 50 percent with identical fragmentation as that which would be



Close-up of the collar of a jet hole—in the fog behind the sludge pile—after the burner and stem have been drawn from the hole

achieved if an 18 ft x 18 ft pattern were used with no chambering. Such chambering has permitted the loading

Approximate Hole Spacing	DRILL PATTERNS AND CHAMBERING PRACTICE			
	Ft of Chamber	Height of Bench	Total Depth of Holes	Tons per ft of Hole
18 x 18 ft	None	25	29	31
20 x 20 ft	4	30	39	38
21 x 21 ft	6	35	39	42
22 x 22 ft	8	40	44	46

Actual Chambering Data			
Average Chambered Hole Size		13 in.	
Average Chambering Time per Hole		21 min.	
Average Total Length of Chamber Burned per Hole		6.5 ft	

TABLE IV—ROTARY DRILLING PENETRATION RATES AND ESTIMATED BIT LIFE

Rock Types	Ft per Hr	Bit Life, Ft	Jet Piercer (Table I)
			Ft per Hr
Conglomerate	22	880	20
Lean Hematitic Iron Formation	17	680	17
Argillaceous Iron Formation	24	960	14
Very Lean Magnetic Iron Formation	13	520	16
Unoxidized Iron Formation	9	360	15
Diorite Dikes	25	1000	12
Sericite Dikes	27	1000	9
Estimated Mine Average—Bit Life		700	
Type of Bit—Tri-Cone (Tungsten Carbide Compacts)			

TABLE V—ROTARY DRILLING ACTUAL TEST DATA: AVERAGE TIME DISTRIBUTION PER BIT USED

No. of Bits	Footage	Rotating Time	Moving Time	Repair & Delay Time	Total Time	Availability
3	671	42 hrs.	12 hrs.	19 hrs.	73 hrs.	58%
Average Penetration Rate					16 ft per hr.	
Hydraulic Pressure					75 ft per shift	
Total Weight on Bit					850-900 psi	
Average Rotating Speed					55,250-58,500 rpm	
Air Volume at 60 psi					35 rpm	
					800 cfm	

of up to two-thirds of the weight of the total powder charge required for the hole in the bottom one-third of the hole, or approximately 55 to 60 lb of powder per ft in the chamber. Such loading policies have proven to be very successful and have helped to reduce the cost of secondary blasting, loading, and primary crushing.

To produce the chambers in the formations at Humboldt, tests have indicated that in extremely hard rock, two quick passes more consistently opened a large chamber than one slow pass. For softer formations, one slow pass is indicated as the correct operation. In the former case, a piercing rate of 7½ in. per min is used while in the latter or medium hard rock operation, a rate of 4 in. per min is needed to enlarge the hole. In either case, the total chambering time remains fairly constant and as indicated in the table, this chamber would average 13 in. in diameter.

Hole Pattern

In the blasting of these drill holes, rather than firing by rows in multiple row shots, better fragmentation has been realized by pulling a V-cut. Since the Humboldt primary crusher is a 48-in. gyratory, additional efforts are made at achieving good fragmentation. These include drilling and blasting simultaneously with the primary blast holes of vertical 3-in. wagon drill holes located between the jet holes in the case of badly jointed areas. Deck loading has been used on the smaller hole spacings to raise the powder column rather than resort to small cartridges. Stemming has averaged 14 ft for a 38-ft hole, calculated as the average hole depth at the Humboldt operation to date. De-sensitized cartridge explosives with pellets, or in recent practice with shucked ammonium nitrate explosives, have produced virtually the same results.

Rotary Tried

In an effort to thoroughly evaluate the drilling problem at the property, a rotary blast hole drill is presently being tested. Although the information in Tables IV and V is based on only 2012 ft of drilling, it presents an opportunity to outline recent experimentation with this type of drill as well as an opportunity for a limited comparison with jet piercing. It must be kept in mind, however, that only a minor footage of drilling is being considered.

Upon analyzing this data it appears that rotary drilling is quite favorable, particularly since the experimentation often added to the moving and delay time. However, certain operating factors involving this rig present problems which may tend to discount these optimistic figures. The rotary rig is most effective in broken ground, which

(Continued on page 119)

DART SINCE 1903 . . . A PIONEER IN

ENGINEERING and BUILDING OFF HIGHWAY TRUCKS

10 Ton to 55 Ton Capacity

MODEL 10-S — 10 ton end dump truck, powered by 150 H.P. Diesel Engine. 13,000# front axle with 17½" x 3" air brakes. 26,000# full floating double reduction rear axle with 16½" x 7" air brakes. 12.00 x 20, 16 ply rock lug tires all around. Hydraulic steering. Approximate weight with body and hoist, 20,000#.



MODEL 18-S-UG-S — 18 ton underground truck powered by 200-300 H.P. Diesel Engine with torque converter and fully reversible transmission. Hydraulic motor operates steel apron conveyor. Equipped with exhaust scrubber. Hydraulic steering. Operates as shuttle car. Height, 60"; width, 11'0"; length, 28'. Approximate weight, 43,300#.

MODEL 20-S — 20 ton end dump truck powered by 225-275 H.P. Diesel Engine. 20,000# front axle with 17½" x 4" air brakes and 70,000# full floating planetary rear axle with 20 x 9" air brakes. 14.00 x 24, 20 ply rock lug tires front, 16.00 x 25, 24 ply rear. Hydraulic steering. 5 speed transmission or torque converter with 4 speed transmission. Approximate weight with body and hoist, 35,000#.



MODEL 25-SL — 25 ton end dump truck, powered by 300 H.P. Diesel Engine. D-75-S rear axle, 100,000# capacity. FU900 front axle, 25,000# capacity. 20 x 9" air brakes. Torque converters optional. Hydraulic steering. 14.00 x 24 front tires, 18.00 x 25, rear tires. Approximate weight, 48,000# with body and hoist.

MODEL 50-S-BDT — 60 cubic yard bottom dump coal hauler. 300 H.P. Diesel Engine, Allison converter and 3 speed transmission, or optional Twin Disc converter and 4 speed transmission. Trailer axle, 85,000# capacity, 20 x 9" air brakes, hydraulic dump. Approximate weight, 68,000#.



MODEL 35-T — 35 ton side or end dump truck, powered by 300-400 H.P. Diesel Engine, 25,000# front axle with 16.00 x 25 tires all around. 200,000 tandem full floating rear axle. Torque converters optional. Hydraulic steering. Approximate weight, 70,000# with body and hoist.

D-115

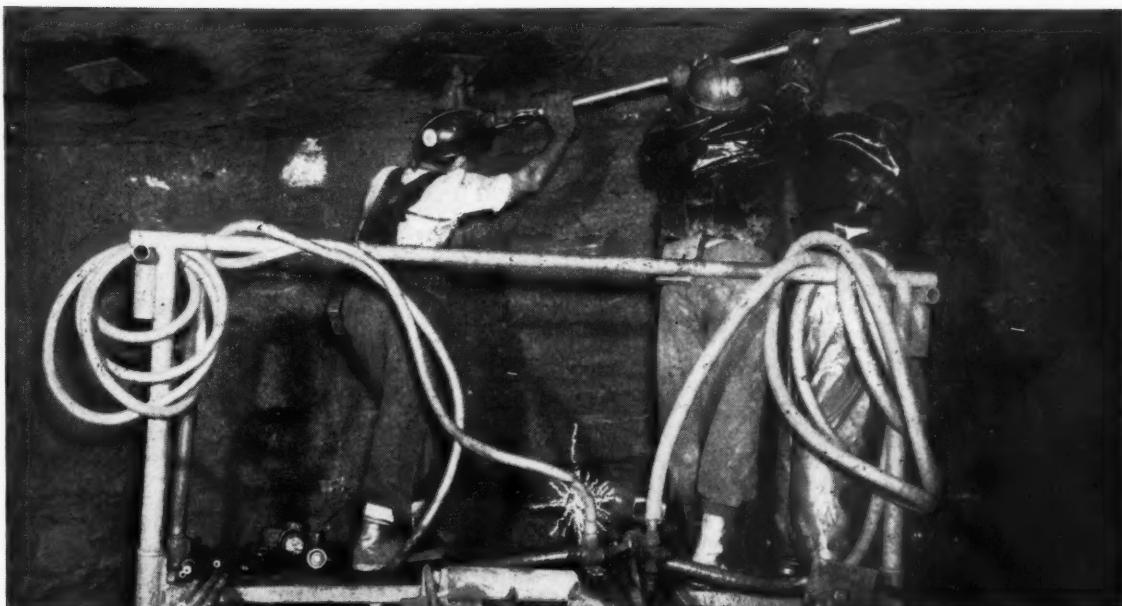
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dependability

Some Rock Bolting Costs



Estimates indicate more than a million bolts per month are installed in metal and industrial mineral mines

Cost of Roof Bolting Varies Widely in Metal and Nonmetallic Mining and Is Considerably Higher Than in Coal Mining, Chiefly Because of the Type of Material Drilled and Bolted. Some Cost Figures on 30 Different Mines Are Presented in this Report

WRITTEN as a sequel to the article, "Some Roof Bolting Costs," that appeared in the January issue of MINING CONGRESS JOURNAL and dealt with several bituminous coal mines, this report concerns itself with 30 metal and nonmetallic mines that are located in 12 different states in this country. Material upon which this article is based has been furnished by Edward M. Thomas, mining engineer in charge of roof control, U. S. Bureau of Mines.

The USBM estimates that over 1,000,000 bolts are installed monthly in metal and nonmetallic mines; indicating how important a part rock bolting plays in non-coal mining today. It is not surprising that much has been said and written about the various phases of rock bolting. The theory, the economic advantages, the safety, and other benefits have all been thoroughly discussed. The chief problem now seems to be how to improve the art.

Since mining methods, ground conditions, and economic conditions vary from mine to mine, bolting procedures

and equipment do too. In order to provide mine operators with some information on the various phases of roof bolting operation, the USBM canvassed the industry and obtained information from metallic and nonmetallic mines as shown in the table. Among other things, the table illustrates the variances in sizes and types of rock bolts and drill bits; size of drilling crews; number of bolts installed per shift; some of the bolting patterns employed; and a few cost figures.

Arrangement of Data

Information in the table is tabulated according to the type of mine. Kinds of mine roof reported included various types of sedimentary, metamorphic, and igneous rock. These materials reflect a wide range of resistance to drilling and it is unfortunate that there is no direct way of comparing the drilling conditions at the different mines reported.

It should be noted that at various

places in this report, so-called average values are given. These are arithmetic averages and not weighted ones. Although desirable, it was not possible at this time to give properly weighted averages.

Percussion Drilling

The most popular drilling method reported was percussion drilling with stoppers. Whether or not dust collectors were used and whether wet or dry drilling was done is not known. Of the 30 mines reporting, 26 used percussion drilling with air legs or stoppers, three used rotary drilling, and one used both percussion and rotary drilling.

Bits and Bit Sizes

Several types of bits were employed: carbide insert—detachable, integral or auger; chisel bit; integral alloy steel; single use; and carbide alloy detachable. The most common bit used by the companies reporting was some form of the carbide insert; 17 mines,

TABLE I—ROCK BOLTING IN METAL AND NONMETALLIC MINES

Mine No.	Type of mine	Location	Working height, feet	Type of material drilled and bolted	Type of drilling	Bolt diameter and type	Type of bit	Bit size, inches	Bit cost per ft. of hole, including resharpening	Length of bolt, inches	Bolt count, ^a materials ^b	No. of men in crew	Bolts per 8 hr. per crew		
				P. stoppers	1-inch slotted.	Carbide insert, detachable.	1 3/8	1 3/8	\$8,035	70	\$1,87	2	30		
1	Oil shale (marl)	Colorado	39	Marl	R., - - - - -	7/8-inch exp. sh.	Carbide insert, auger.	1 3/8	70-100 per sharpening.	50-84	1.18	2	75		
2	Potash	New Mexico	6-11	Hallite and sylvite	R., - - - - -	3/4-inch exp. sh.	Carbide insert, auger.	1 3/8	6,000	- - - - -	74	1.37	2	60	
3	Potash	New Mexico	6-12	Hallite and sylvite	R., - - - - -	3/4-inch exp. sh.	Carbide insert, auger.	1 3/8	7 1/16	- - - - -	72	1.80	2	50-60	
4	Potash	New Mexico	6-12	Hallite and sylvite	R., - - - - -	3/4-inch exp. sh.	Carbide insert, auger.	1 3/8 R	1 3/4 P	P. 648 P. 380	- - - - -	60-96 1-in. 1.60	2	exp. 30 sl. 40	
5	Trona (sodium bicarbonate),	Wyoming	8	Medium shales	- - - - -	P. stoppers; R, 1-inch slotted.	Carbide insert, detachable.	1 3/8	1 17/32	2,500	- - - - -	72	1.80	2	30
6	Uranium	Utah	7-25	Soft sedimentary rocks,	P. stoppers	1-inch slotted.	Carbide insert, detachable; chisel bit.	1 3/8	310	.065	48-72	exp. 2.38	1-2	48-30	
7	Lead, zinc	Idaho	min. 8	Various metamorphosed and igneous rock.	P. air leg and exp. sh.	3/4-inch exp. sh.	Carbide insert, detachable.	1 3/8	- - - - -	- - - - -	48	1.60	2	30-35	
8	Lead, zinc	Idaho	min. 8	Various metamorphosed and igneous rock.	P. stoppers	1-inch slotted.	Carbide insert, detachable.	1 3/8	480	- - - - -	68	1.95	2	414	
9	Lead, zinc	Idaho	min. 8	Various metamorphosed and igneous rock.	P. stoppers	1/4-inch exp. sh.	Carbide insert, detachable.	1 3/8	- - - - -	- - - - -	72	1.84	2	414	
10	Lead, zinc	Idaho	min. 8	Various metamorphosed and igneous rock.	P. stoppers	1-inch slotted.	Carbide insert, detachable.	1 3/8	- - - - -	- - - - -	48	1.73	2	5	
11	Lead, zinc	Idaho	min. 8	Loosely compacted quartzite.	P. stoppers	Wood	Integral alloy	2 1/8	- - - - -	- - - - -	96	2.05	2	25	
12	Copper, gold, silver.	Arizona	40	Limestone, granite, lime garnet, breccia, fractured quartzite.	P. stoppers	1-inch slotted.	Carbide insert, detachable.	1 3/8	500	- - - - -	48-72	0.45	2	412	
13	Copper	Arizona	8	Igneous	P. stoppers	1-inch slotted.	Single use	1 3/8	1 3/4	60	3.09	2	412		
14	Copper	Arizona	15	Igneous	P. stoppers	1-inch slotted.	Single use	1 3/8	1 3/4	40	1.75	2	412		
15	Copper, zinc	Arizona	30	Igneous	P. stoppers	1-inch slotted.	Carbide insert, detachable.	1 3/8	- - - - -	- - - - -	69	1.75	2	412	
16	Copper, gold, zinc	Washington	min. 8	Various metamorphosed and igneous rock.	P. stoppers	3/4-inch exp. sh.; and air legs.	Carbide alloy, 1-inch slotted.	1 3/8	1 3/8	100-300	.050 .058	exp. 66 sl. 58	2.31	2	
17	Copper	Utah	8-15	Various metamorphosed and igneous rock.	P. stoppers	3/4-inch exp. sh.; and air legs.	Carbide alloy, 1-inch slotted.	1 3/8	1 3/8	- - - - -	48-96	2.41	2	40	
18	Copper	Michigan	min. 8	Dense felicitic igneous rock.	P. stoppers	3/4-inch exp. sh.	Carbide alloy, detachable.	1 3/8	600	.02	48-72	1.62	2	10	
19	Copper and other allied metals.	Montana	min. 7	Various types of igneous rock.	P. stoppers	3/4-inch exp. sh.; and air legs.	Carbide alloy, 1-inch slotted.	1 3/8	6	- - - - -	exp. 73 sl. 68	1.41	2	45	
20	Gold	South Dakota	Open stopes;	Hard, igneous	P. air legs	1-inch slotted.	Carbide alloy, detachable.	1 3/8	400	.075	60 & 96	1.50 8' 2.02	- - - - -	4	
21	Gold, silver	Washington	min. 8	Various metamorphosed and igneous rock.	P. stoppers	1-inch slotted.	Carbide insert, integral.	1 3/8	400	.042	72	1.37	1	20-30	
22	Molybdenum	Colorado	8	Variable soft igneous rock.	P. air legs, light-weight stoppers.	3/4-inch exp. sh.	Carbide insert, detachable.	1 3/8	240	.045	84	1.64	2	25	
23	Iron	Michigan	min. 8	Compacted quartzite, dolomite, and bentonite.	P. stoppers	1-inch slotted.	Carbide alloy, detachable.	1 1/2	209	.074	72	2.51	2	20	
24	Iron	Michigan	min. 8	Compacted quartzite, dolomite, and bentonite.	P. stoppers	7/8-inch exp. sh.	Carbide alloy, detachable.	1 3/8	300	.039	60	31.45	2	30	

25	Iron	Michigan	min.	Compacted quartzite, dolomite, and paint rock.	P. stoppers -	7/8-inch exp. sh.	Carbide alloy: detectable:	1 1/4	300	.039	60	1.45	2	20-30
26	Iron	Michigan	min. 8	Compacted quartzite, dolomite, and paint rock.	P. air legs -	7/8-inch exp. sh.	Alloy steel, integral.	1 1/2	100	- - - - -	exp. sl. 96	1.50	2	47
27	Iron	Michigan	min. 8	Compacted quartzite, dolomite, and paint rock.	P. stoppers -	3/4-inch exp. sh.	Carbide insert, detachable.	1 3/8	250	.060	60 & 72	1.24	2	20-30
28	Iron	Wisconsin	min. 8	Compacted quartzite, dolomite, and paint rock.	P. stoppers -	3/4-inch exp. sh.	Carbide insert, detachable.	1 1/8 exp. sl.	200	.052	60	exp. 1.03 sl. 1.50	2	41.5-20
29	Iron	Alabama	8-14	Thinly bedded, sandy shales and sandstones.	P. stoppers -	1-inch slotted.	Carbide inserts, integral.	1.285	1,200	.030	50% 60 35% 72 15% 96	1.28	3	10
30	Iron	Alabama	10	Thinly bedded, sandy shales and sandstones.	P. stoppers -	1-inch slotted.	Carbide inserts, detachable.	1 1/2	400-600	.030	85% 48 13% 72	1.12	3	28

¹ P. percussion; R. rotary.

² Where holes of various lengths are used, this is an average cost.

³ Bolts are made with left-hand threads so they can be tightened with rotation of percussion drill.

⁴ Part-time basis; bolting crew also does other work; usually bolting is on contract rate per bolt.

or 57 percent, utilizing this kind. One mine employed both carbide insert detachable and chisel bits, two used integral alloy steel, three utilized single use bits, and seven employed carbide alloy detachable bits.

Fourteen different combinations of bit sizes were used by the various mines. No one particular combination predominated, but 14 mines did use a 1 3/8-in. size bit to finish their holes, following the trend to smaller holes. Other sizes used for finishing holes ranged from 2 1/8 down to 1.200-in.

Of the 30 mines, 17 start roof bolt holes with larger bits than are used to finish the holes. This indicates gauge wear and rod pulling are still very real problems. Mine No. 5 was unique in that it used a rotary drill with 1 3/8-in. bit to start the hole and a percussion (stoper) drill with 1 1/4-in. bit to finish it. In the table, wherever only one size bit is shown, it should be considered as both the starting and finishing size.

Drilling footage per bit varies considerably. Values ranged from six to 6000 ft. Some mines reported variations within their operation. Mine No. 2 reported 70 to 100 ft of hole per bit per sharpening; Mine No. 17 gave 100 to 300 ft of hole per bit; and Mine No. 30 reported 400 to 600 ft of hole per bit. This merely demonstrates the imponderables due to wide variation in local conditions.

Bolts

Major bolt types used were the one-in. slotted and the 3/4 and 7/8-in. expansion shell. Several mines utilized both slotted and expansion shell bolts and the table shows equal popularity for the two types.

Length of bolts varied from 48 to 96 in., with the average being about 68 in. Eleven mines used various bolt lengths. Mines No. 16, 19 and 26 used two different lengths of bolts, the expansion shell bolt being one length and the slotted bolt another.

Two-Man Bolting Crews

Of the 30 mines reporting, 26 used two-man crews, one used a one-man crew, two used three-man crews, and one mine used either one or two-man crews. These crews installed up to 75 bolts per shift, although the average would be considerably less. Many of the mines reported that their bolting crews did other work in addition to roof bolting—bolting often being on a contract rate per bolt.

Some Cost Figures

Bit cost per ft of hole includes resharpening. Values ranged from a low of \$0.0035 to a high of \$0.075 per ft of hole, with the average being about \$0.0449. Only one mine reported a bit cost per ft of hole of less than one cent. The material drilled and the

skill of the drill operator are important factors.

Cost of the roof bolts at the mines surveyed varies widely, depending in part on length of bolt, size of bolt, type of bolt and distance from a supplier. It should be noted in the table that where bolts of various lengths are used, an average cost is given. Costs ranged from \$0.45 to \$3.14 per bolt, with an average cost of approximately \$1.72.

It was mentioned previously that bolting was often done on a contract rate per bolt. Some of the mines gave their contract rates for installation, and these varied from \$0.75 up to \$2 per bolt, with different rates for each length involved at a mine. It is interesting to note at mine No. 25 that contract rates for installation almost doubled production. Mine No. 13 gives a total cost per bolt installed of \$3.75, plus \$3.14 for materials.

Bolting Patterns

Noting the various types of bolting patterns used, it is seen that much experimentation has been done at most of these mines to try and find a pattern that would do the best job. Most of the bolting patterns are simple with the bolts on definite centers—for example, four-ft centers, five-ft centers, four-ft lateral centers and five-ft longitudinal centers, to mention a few. Mine No. 10 has an interesting pattern. They use six bolts on 2 1/2-ft centers in rings with the rings on four-ft centers in the drifts. Mine No. 22 uses 2 1/2-ft spacing with rings of seven bolts in fanlike pattern. Other mines have no definite pattern or else use spot bolting.

One mine, No. 6, uses wooden headers, 12 by 3 by 18-in., with 3/8 by 8-in. bearing plates, and also wire mesh. The bolting pattern was not given. Mine No. 12, where bolts are installed on 4-ft centers, uses 3 by 12 by 36-in. headboards and 3/8 by 8-in. steel bearing plates. The use of 3 by 12 by 24-in. headboards is standard practice at Mine No. 16 except in slusher drifts where bolts are grouted into place for greater strength and resistance to blasting. At Mine No. 24 4 by 4 by 3/8-in. bearing plates are used with roof ties.

It can be seen from a study of the table that most operators are trying to improve their rock bolting practices with varying degrees of success. The art is beginning to take on a little polish.





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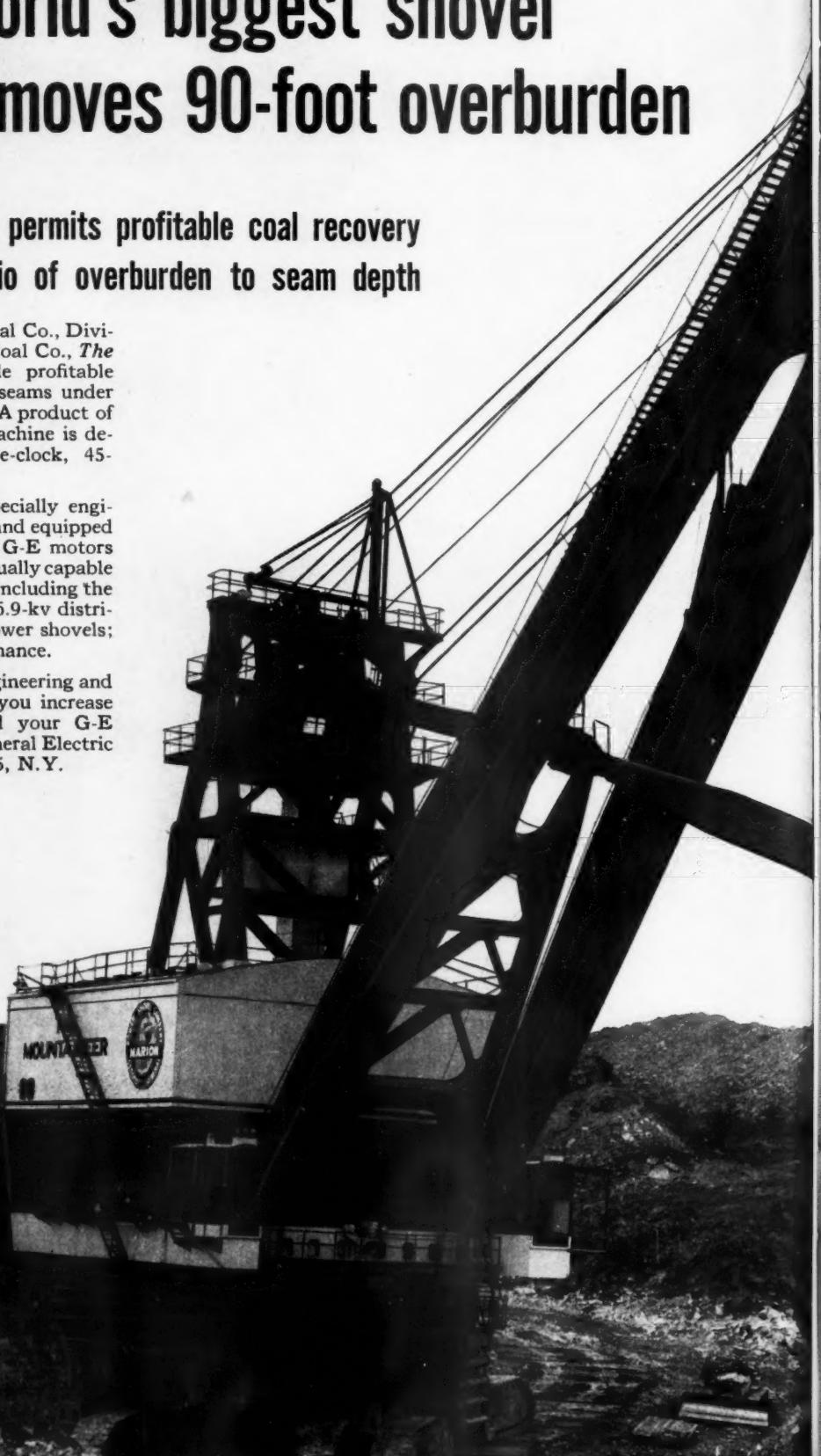
World's biggest shovel removes 90-foot overburden

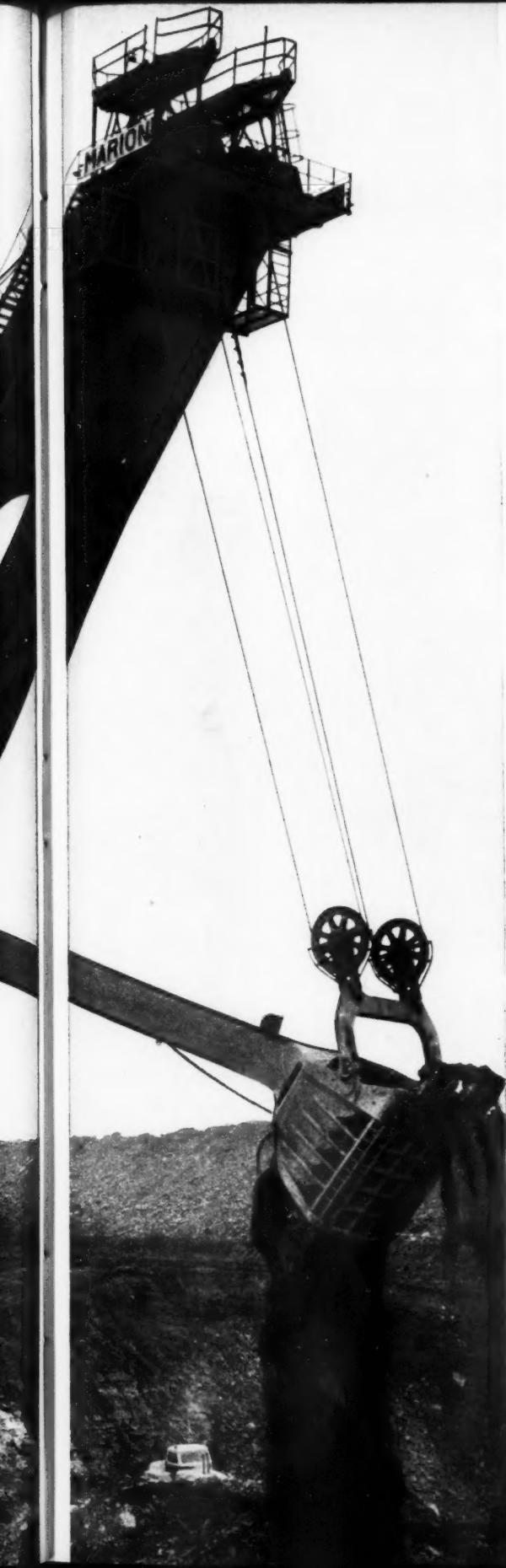
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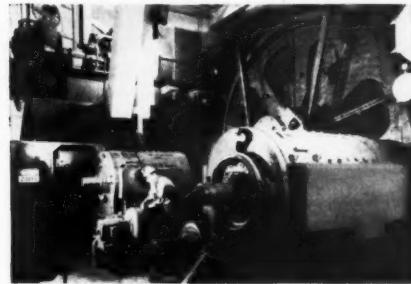
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G-E ANALOG COMPUTER, enabled engineers of Hanna, Marion, and G.E. to complete in two weeks calculations on design and performance that might have taken three years.



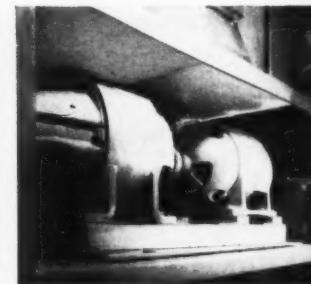
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The Blind River District and Algoma Uranium Mines Limited

Progress Is Traced by a Canadian Mining Authority Who Covers: Geology and Exploration—Mine Development—Townssite Construction—Surface Plants—

Milling and Metallurgy—Costs and Financing

By DR. EARL B. GILLANDERS

Managing Director
Algoma Uranium Mines, Ltd.

THE Blind River uranium area is midway between the Sudbury nickel mines and Sault Ste. Marie, bordering the north shore of Lake Huron. The surface is rough and rocky with spotty stands of pine, spruce and hardwoods.

The uranium deposits are found in quartz-pebble conglomerate bands near the base of the Mississagi quartzites of late pre-Cambrian age, which lie unconformably on older basement rocks. Their contact forms a large inverted and flattened "S" with the Pronto deposit on the South Belt, the Nordic Lake deposits on the Middle Belt and the Quirke Lake deposits on the North Belt.

Pronto is adjacent to the main line of the Canadian Pacific Railway and Highway 17, but Nordic is about 17 miles north and Quirke about 30 miles north.

Initial diamond drilling away from the highway was supplied by air. Construction of a typical bush road was started in September 1953 and this has since serviced much of the drilling and initial development and construction. The Ontario government now plans to build a permanent road.

It was fortunate that a main line of the Ontario Hydro system paralleled the highway. A 44 KV line has been built to Quirke Lake to supply power needs.

Existing communities are both inadequate and too distant to supply living accommodation so a townsite is being established at the east end of Elliot Lake, midway between Nordic and Quirke.

It will be seen from the above that in less than two and one half years after first drilling, sales contracts totalling \$444,160,000 have been let and one mine is already producing.

During this period widespread drilling has established three major ore areas. The Pronto area appears cut off by a fault to the south and thus will lie wholly within Pronto boundaries. The Nordic ore area runs northwest through Algoma's Nordic

property into Lake Nordic ground and should cross the northeast corner of the Lake Milliken property. Its northern limits have not been determined. The Quirke ore area runs southeast across Algoma's Quirke property through Consolidated Denison, Spanish American, Can Met and other claims for a known distance of over five miles. Its boundaries have not yet been delimited.

Since much of the diamond drilling has been of a scattered exploratory nature other ore areas may be found. The known areas, although not accurately outlined, indicate reserves of at least 150 million tons with a gross value of over 3 billion dollars at current prices. The above does not include large tonnages grading 0.07 percent to 0.08 percent U₃O₈ which have been drilled and can provide a tremendous amount of uranium if sufficiently needed.

All the Blind River ores contain some thorium and the apparent in-

creasing demand for this metal could supplement uranium income. In parts of the district thorium largely replaces uranium values and drill intersections assaying up to two percent ThO₂ have been obtained.

Algoma Uranium Mines Limited

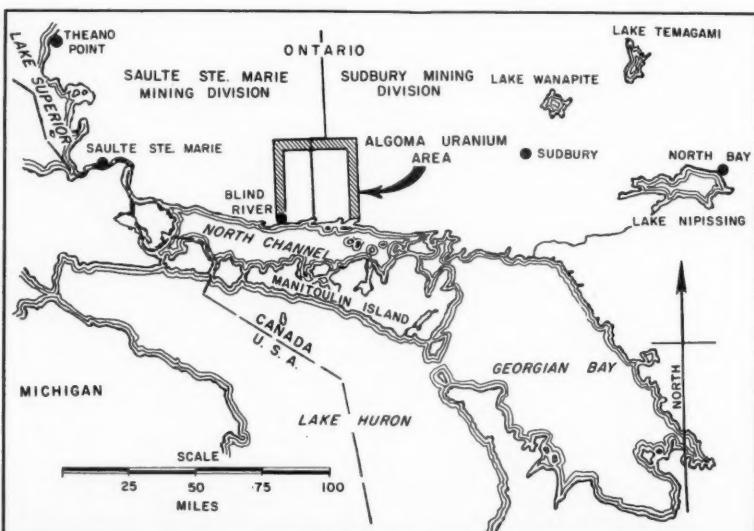
It has already been stated that the two mines of Algoma are located on the Middle and North Belts.

Diamond drilling by late 1954 had proven the last published ore reserves to shallow depths of 6,280,000 tons averaging 0.106 percent U₃O₈ at Quirke and 4,990,000 tons averaging 0.131 percent U₃O₈ at Nordic. More diamond drilling has greatly increased these tonnages, with similar grades since that date.

Development started in July 1954 with the collaring of the Quirke shaft. The shaft is completed to 864 ft with six levels and lateral work is in progress. The development of the Nordic mine is about six months behind that of the Quirke property. Construction started in April at Quirke and site preparation in June at Nordic. The scheduled production dates are September 1956 for Quirke and November 1957 for Nordic.

Housing

Since Algoma is in unorganized territory we have had the problem of providing all the accommodation for



Map showing the Blind River and Algoma uranium area north of Lake Huron

both construction and operating personnel.

It was decided that the bulk of the housing should be in a central community rather than at the properties. Therefore, residences for only key personnel have been built at the mines requiring 13 houses at Quirke and 19 at Nordic.

To facilitate construction at Quirke and to look after excess men during this period temporary accommodation and dining facilities for 450 employees were built at the property.

In locating the townsite we were fortunate in having an ideal site around the east end of Elliot Lake in beautiful hardwood forest. The townsite is being laid out progressively by the Ontario Department of Planning and Development, but it has fallen on Algoma to clear and supply services for the part we require immediately. We have now built 13 living units, a cafeteria and food warehouse, and a three-room school and are building 25 houses. The 13 units will house 650 men on a single status basis. We plan on expanding family dwellings, probably 100 houses in 1956, and as such accommodation becomes available the single man units will be converted into apartments.

The district union is considering building a recreation center and is being encouraged in this venture. There have been many applications to establish stores and other businesses as soon as permanent sites are available. The town is expected to grow rapidly to a population of about 10,000 persons in the next several years.

Plant Layout

Considerable variation in layout of the two plants has been necessary due to the differences in terrain. Despite this the bulk of the equipment has been kept identical to allow a minimum of spares. Parts of the Nordic surface establishment has been enlarged to allow some centralization of managerial staff and extra shop, research and packaging facilities.

In this climate we favor consolidation of services and if ground conditions had permitted we would have placed the switchhouse, hoists, compressors, change house, offices, warehouse and shops under one roof around the shaft. At Quirke we have had to separate the office - warehouse and shops. The concentrator is contained in one building except for the cone crushers and screens and 10 large unhoisted thickeners. A 146-ft standpipe adjoins the powerhouse which houses the boilers, fire pumps and a 1000 KW standby unit. All the above buildings are connected by concrete tunnels to accommodate all electric, water and steam lines. The main water supply to the standpipe is by a 16-in. main from a pump station about one half mile distant.

History

Radioactivity was first found in the district in 1949 but uranium values seemed to be negligible.

Franc R. Joubin re-examined the exposures in April 1953. He assayed for both uranium and thorium and found both too low to account for observed radioactivity. He, therefore, concluded that the uranium was leached and the activity was due to the decay products remaining.

On this assurance J. H. Hirshhorn financed drilling at Pronto in May 1953. The first holes established the leach theory and found commercial ore below the leached zone.

Such results made the whole of the Mississagi contact, known from Collins' geological map, of potential value. For the large scale staking project Hirshhorn and Joubin solicited the aid of Preston East Dome Mines through the president, W. H. Bouck, Q. C. Staking was accomplished between late May and early July under the direction of W. A. Hutchison and R. C. Hart, manager and chief geologist of Preston. Preston retained control of 632 claims now comprising the Algoma properties.

The recording of the claims started a rush and the whole district was blanketed during the summer.

The access road, built by Algoma, was being used for winter traffic in late 1953.

In August 1954, Pronto Uranium obtained their sales contract with Eldorado Mining and Refining, the government purchasing agency, for \$55,000,000 to start production at 1000 tons per day and later increase to 1500 tons. They had started sinking in June 1954 and construction in September 1954. Their plant commenced production in September 1955.

The power line to Quirke was started in January 1955.

Algoma Uranium obtained their sales contract in March 1955 for a total of \$206,910,000 for two plants of 3000 tons per day each.

Construction of Algoma's Quirke Lake plant started in April 1955.

Consolidated Denison announced their sales contract in August 1955 for \$182,250,000 at 5700 tons per day. They are already sinking two shafts and planning construction.

Underground

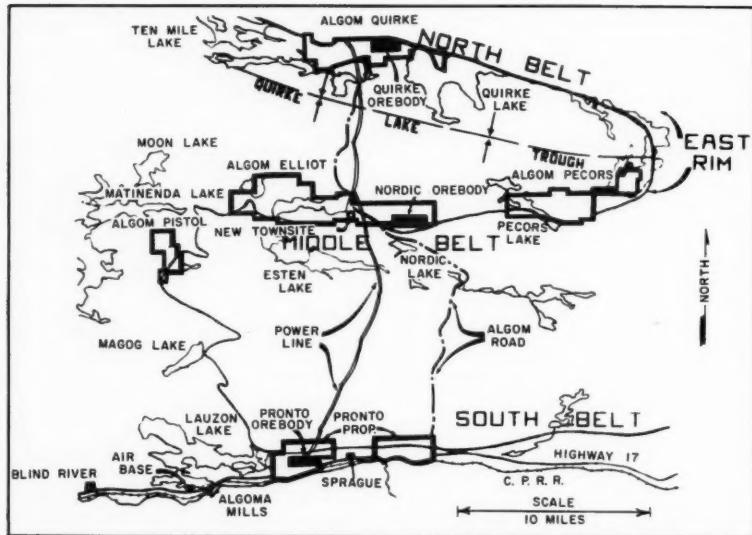
Both mines have identical rectangular shafts to a depth of about 870 ft. There are two skip compartments at one end, a central service cage compartment, and manway, counterweight, pipe and airway compartments in the other end. Seven-ton bottom dumping skips are being used. Both hoists are Canadian Ingersoll Rand PE 1's with a 10-ft drum diameter. The equipment will hoist 375 tons per hr from our present depth and the hoist can be speeded to maintain this rate as the shaft is deepened.

The Quirke ore body has a strike length of about 7000 ft, an average thickness of 12 ft and dips about 37° south. The dip is thus too flat for comfortable conventional mining and too steep for trackless methods. The levels are approximately 100 ft apart leaving a stoping distance of about 200 ft. To aid sill floor recovery in mining, the level drifts are located in position to lay the track on the footwall. Scram drifts are driven in ore above a thin crown pillar. On every

third level a footwall haulage drift will serve collection raises driven on 300-ft centers to the scram drifts of the two levels above. Ore from the third level stopes will be pulled through short box holes from the scram drift. Trolley locomotives with 120-cu ft Granby cars will be used in ore haulage.

Stoping will start from slope raises driven from the scram drifts midway between the collection raises. Distances have been kept short for initial mining until experience is gained but will most likely be expanded in deeper development. The plan now is to mine 50-ft panels up the slope of the ore, scrape to the scraums and along them to the collection raises. Each panel will be fenced, to allow loading and blasting the start of the adjacent panel, and filled with mill sands shortly after mining. Thus only the crown pillars will be left and it is hoped to recover most of them before levels are abandoned.

The ore is very siliceous as well as radioactive so positive ventilation is important. This will necessitate care-



At least 150 million tons with a gross value of over three billion dollars are indicated in this area

ful routing of the air and avoiding of very wide openings. Initial fan capacity will be about 250,000 cfm and the air will require heating in the winter.

The Nordic ore has a strike length of 5500 ft, a nine-ft average thickness and a dip of 18° north.

At the time of writing the mining

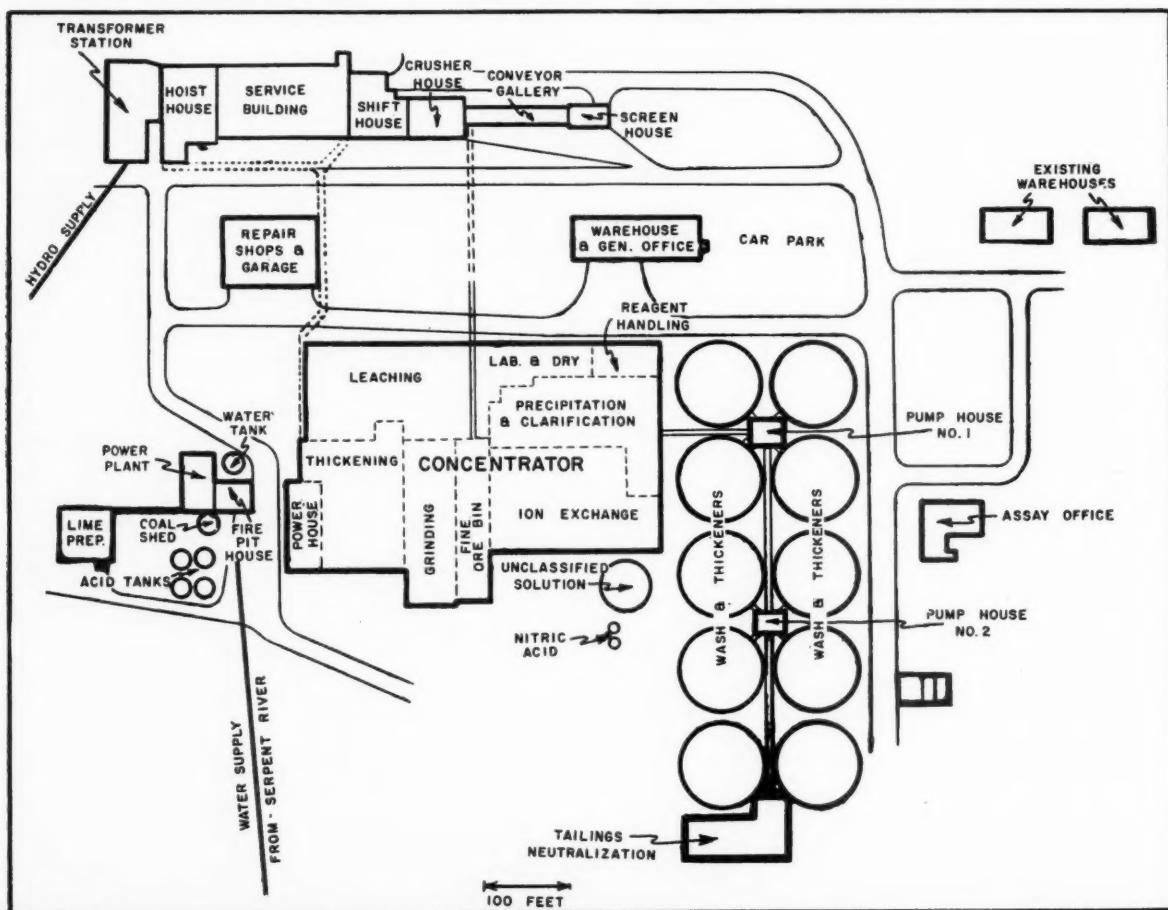
layout is still being studied. It is a little steep for trackless methods but will probably be mined in this manner from two levels. Any trackless method will have to be adapted to stope filling and relatively small openings for ventilation control.

The insistence on a fill system is not dictated wholly by ventilation. There are irregularly shaped hanging wall ore bodies in both mines that we hope to extract later.

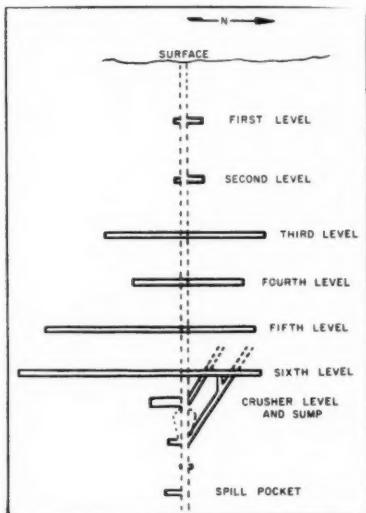
Milling

Our milling practice, as devised by R. P. Ehrlich in conjunction with the Dominion Department of Mines personnel, is similar to that used in South Africa. We have been fortunate in obtaining R. R. Porter, who has played a leading role in the development of the South African metallurgy, as our consulting metallurgist.

The uranium is contained in a quartz pebble conglomerate with a quartzitic matrix. There is an average of four to five percent pyrite both disseminated and as streaks in the ore. Initial studies suggested most of the values were contained in brannerite. A fairly constant ratio of four uranium to one thorium and a dearth of titani-



Surface plan of the Quirke mine



Quirke shaft layout

um in the test work suggests the mineral may be of the uranium-thorium oxide series. Finding stringers of impure pitchblende during development work tends to confirm the above. Sooty incrustations of thucolite are seen on joints near surface.

The ore will be crushed to minus 6-in. underground. It will be further reduced to minus $\frac{3}{4}$ -in. by cone crushers in circuit with rod-deck screens and conveyed to a 10,000-ton fine ore bin. Two belts from the fine ore bin will feed two 8-ft by 12-ft rod mills in open circuit. The rod mill discharge will be split to two classifiers in closed circuit with two 9-ft by 10-ft ball mills. Grinding in test work was to 65 percent minus 200 mesh but we have reason to believe we can coarsen the grind without loss of recovery.

The classifier overflow will be thickened in four 45-ft three-compartment thickeners and the moisture content of the underflow reduced to 15 percent in four $8\frac{1}{2}$ -ft by 8-ft disc filters. This was found necessary to eliminate some sulphur compounds which build up in the grinding solution and tend to poison the circuit later.

The cake will be repulped with water and sulphuric acid and pumped to 12 32-ft by 30-ft agitators in series giving a 48-hr contact time. Initially it was thought we would need about 80 lb of sulphuric acid per ton of ore but later test work indicates this may be somewhat reduced.

The discharge from the leach agitators will flow to six 18-ft by 20-ft agitators for partial neutralization with about 30 lb of slaked lime. If a saving in acid can be affected there will be, of course, a corresponding saving in lime. The discharge from these agitators will go to 10 100-ft diameter thickeners using five stage counter current decantation at Quirke, or to 16 14-ft by 16-ft drum filters in two stages at Nordic.

The pregnant liquors from either

the counter current thickeners or the filters will go to 21 ion exchange columns.

The resin will be eluted with nitric acid. The high grade eluate will be partially neutralized with lime to produce a gypsum-iron precipitate. Since this precipitate will contain some uranium it will be filtered off and returned to the leaching circuit. The filtrate will then be neutralized to a pH of 7.0 with caustic to precipitate the uranium. This precipitate will be filtered, packaged and shipped.

The barren solutions from the whole circuit will be completely neutralized and mixed with the tailings pulp for disposal to the backfill preparation plant.

The tailings pulp from the counter current thickeners or filters will be completely neutralized in three 18-ft by 20-ft agitators and this discharge mixed with neutralized barren solutions and pumped to the fill preparation plant.

It is here put through two stages of 12-in. Dorrclothes to yield about 53 percent sands with a percolation rate of about 6 in. per hr. With a coarser grind the percolation rate will improve. The sands will go underground for fill at about 65 percent solids. The slimes from the Dorrclove plant will be pumped to the tailings area.

Our metallurgists have visited and studied South African plants and expect little difficulty in bringing our own into operation.

Costs

Capital Costs

Algom's estimated requirements are roughly as follows:

1. Administration, financing, interest, insurance, roads, power line, temporary construction, metallurgical research,

working capital and inventory	\$8,700,000
2. Surface plants	22,000,000
3. Underground development and equipment ..	7,400,000
4. Exploration, principally diamond drilling	1,000,000
5. Townsite	1,000,000
Total	\$40,300,000

Since our total capital is about \$43,300,000 we thus have about \$3,000,000 for contingencies.

Operating Costs

We cannot, in Canada, give detailed operating cost estimates, although we think we know what they will be within fairly close limits. It has been stated that improvements are still being made in metallurgy and Nordic mining procedure is not finalized. Both will affect our final operating figures.

When preparing data for our contract and financing we arrived at a very conservative over-all operating cost of just over \$11 per ton. With more research and study since that date, we believe there will be some improvement on that figure.

Financing

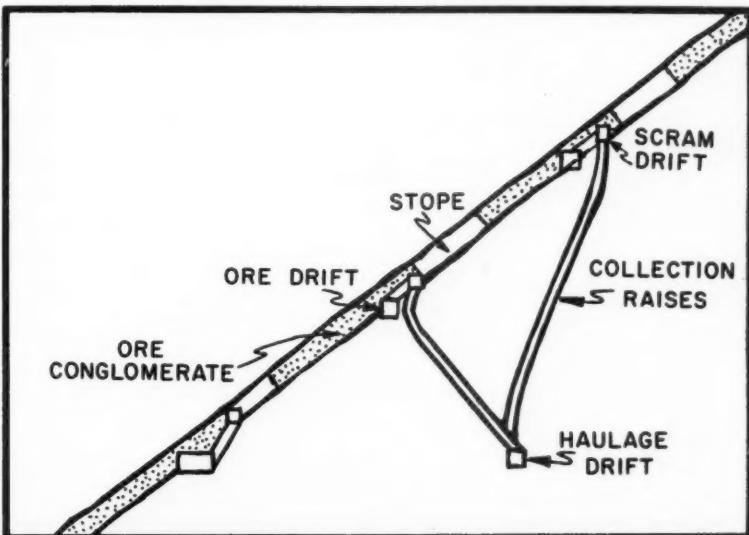
Algom has been financed largely by debenture and bond issues, now almost standard practice in Canadian uranium mines. The financing was arranged by Rio Tinto Co., largely through the efforts of its managing director, J. N. V. Duncan. As a result of these arrangements, Rio Tinto has a management contract through Rio Tinto Management Services.

The procedure to supply \$41,100,000 immediately or as needed is as follows:

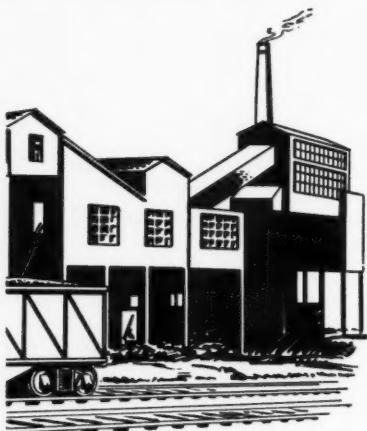
1. In March 1955 Rio Tinto subscribed to 100,000 shares of capital stock at \$11 per share.

2. Rio Tinto arranged the sale at par of \$25,000,000 five percent General Mortgage Debentures maturing

(Continued on page 112)



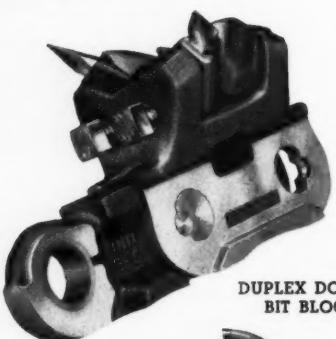
Cross-section sketch of the Quirke drift layout



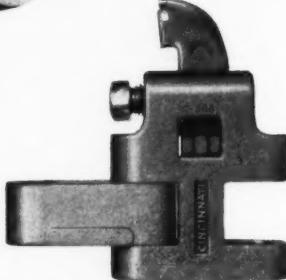
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BIT BLOCK



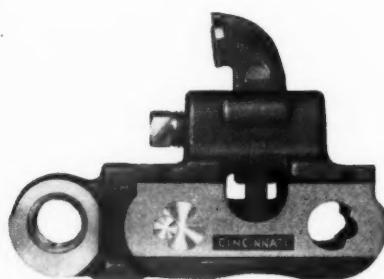
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FOR CARBIDE BITS



BIT BLOCK WITH CINIIDE BIT FOR JOY
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power hydraulic controls minimize fatigue**

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pare with a Link-Belt Speeder for cat-quick agility and long-lived, bulldog stamina. Report after report shows these rigs account for up to 25% or more output per shift.

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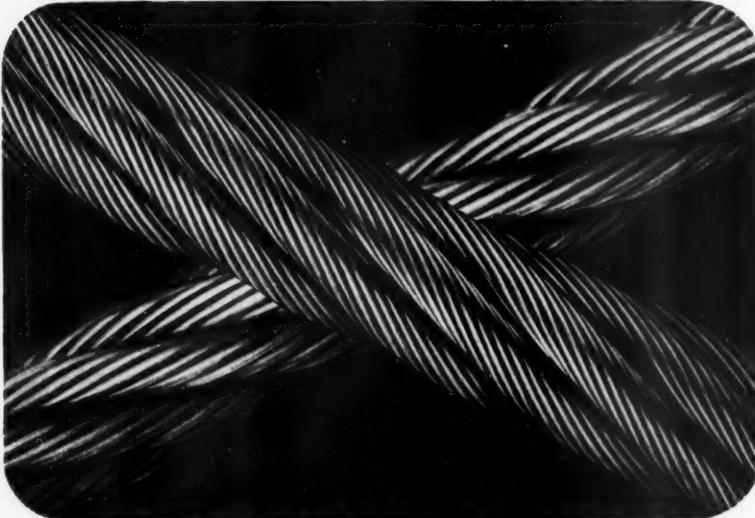
The precision construction, the quality materials and the advanced engineering that have gone into today's Link-Belt Speeder speak for themselves. All we ask you to do is see your distributor and judge for yourself. Be as critical as you like! No shovel-crane on the market today—crawler or rubber-tired, $\frac{1}{2}$ to 3-yd. 8 to 60-ton capacity—can compare. Visit your distributor today or write for literature—**LINK-BELT SPEEDER CORPORATION, CEDAR RAPIDS, IOWA.**

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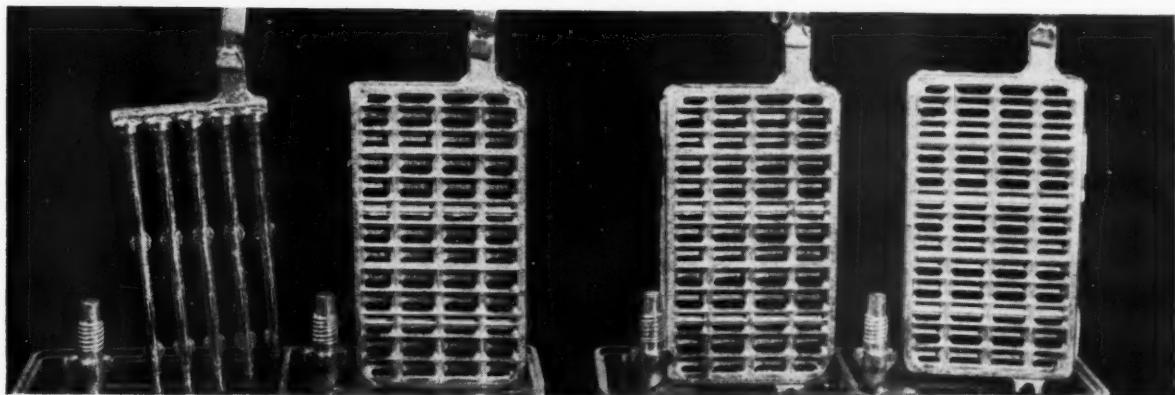
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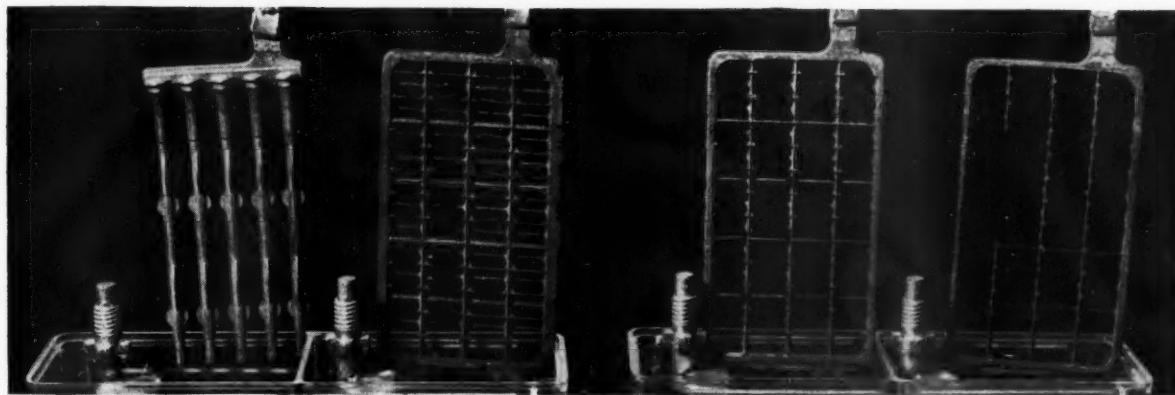


BEFORE: Silvium alloy

Alloy "A"

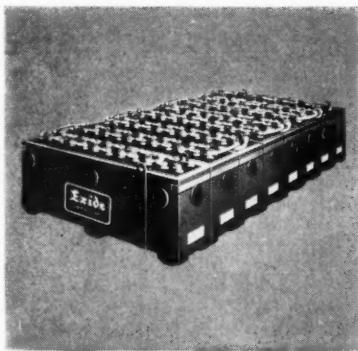
Alloy "B"

Alloy "C"



AFTER: Note how the Silvium grid resisted corrosion. Compare it with the other alloys.

Corrosion resistant SILVIUM prolongs battery life



BATTERY FOR MINING LOCOMOTIVE, Model MVM. Specially designed to fit space provided on locomotive. Has tubular construction of positive plates, Silvium grids, "Permanized" negative plates, extra heavy connectors, and all other Exide-Ironclad advantages that mean power to spare in heavy duty applications. Write for Bulletin 5161.



Reaching down deep into every Exide-Ironclad Battery are the fingers of Silvium alloy metal which form the grids of the famous Exide-Ironclad positive plates.

Silvium is a special alloy developed by Exide to resist corrosion and thus prolong battery life. For proof, Exide research engineers compared the performance of an Ironclad Silvium grid side by side with ordinary grids of other lead alloys. As the photographs above show, only Silvium came through the test without damaging corrosion—undiminished in size, unimpaired in strength. The other grids showed from moderate to severe corrosion.

Tests have proved that Silvium is not only more resistant to corrosion, but also a better conductor of electricity.

Hence it both prolongs battery life and—because there's less internal battery resistance—more readily permits heavy drafts of power.

This special material is only one of the many exclusive features which have made Exide-Ironclad Batteries world famous for high capacity and long life. When you order batteries for heavy duty applications, or the equipment requiring such batteries, be sure to specify Exide-Ironclad. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Phila. 2, Pa.

Exide®



Extended to its full length, the conveyor system moves coal from bin to barge at extreme low water stage

Rail-To-Barge Plant

Jewell Ridge Coal Corp. Provides First Rail-to-Barge Transfer Loading Dock in Cincinnati Area for Eastern Kentucky Coals

THE excellent work of the Corps of Engineers, Department of the Army, during the past 30 years in increasing the number of miles of dependable nine-ft navigable channels, as well as many new locks, dams and harbors, has resulted in the expansion of industry on the inland waterway system. Many new and enlarged plants represent expansions in the production of pig-iron and coke, and many are large consumers of coal. These factors, plus an increased interest in reducing freight rates, have led to the erection of many loading, transfer and unloading docks, and a study of the advantages offered by rail-river freight rates.

The Ohio River Valley is and will continue to be a fast-growing industrial area. The Ohio River and several of its tributaries are large carriers of coal and other freight. The extent to which they can be used for transportation depends largely upon the number of loading, unloading and transfer docks made available to private and public use.

First Such Plant in Area

The Cincinnati area has had, prior to 1955, several barge-to-rail transfer unloading docks but no rail-to-barge transfer terminals. The Jewell Ridge plant, completed in July 1955, will

serve not only the company's own need of placing coal from its Leatherwood seam in Eastern Kentucky on Ohio River barges, but also that of other coal companies which may desire to use these facilities and which can, by use of rail-river rates, economically ship through this plant. The use of the transfer plant by other companies can be arranged by direct agreement with the Jewell Ridge Coal Corp.

The plant is situated on the Licking River, at Wilders, Ky., and is 1½ miles upstream from where the Licking discharges into the Ohio River. Since this junction is directly opposite downtown Cincinnati, the terminal is very near the business section of Cincinnati. It is also located on the Louisville and Nashville Railroad, a short distance from the railroad's De Coursey yards, which serves as a gathering and distributing point for Kentucky coals. The site for the plant, tracks, and river frontage was leased from the L & N Railroad.

61-Ft Change in River Stage

The principal design factor to be considered was the variable river stage. The Licking River is subject to rapid rise and fall, swift current during periods of fast run-off and to Ohio River back-water during flood periods.

By L. I. COTHERN

Director of Engineering
Jewell Ridge Coal Corp.

These factors necessitated a design which would permit operation at river stages varying from low water (441 ft) to track elevation (502 ft). Any water stage above 502-ft elevation will overflow into the track hopper and stop operations. It was also necessary to provide protection for conveyor drives and motors when the river stage exceeded 502-ft elevation.

The method used to obtain flexibility for high and low water operation can best be described by referring to the accompanying photograph and schematic drawing. The photograph shows the plant in operation during an extreme low water stage. The schematic drawing utilizes solid lines for showing low water operation and broken lines for high water operation.

For reasons of both space and economy, a single track hopper was used. Both loaded and empty tracks have a capacity for 30 cars. A Link-Belt car shaker assists in the unloading operation. Coal is loaded from the hopper to the 36-in. belt conveyor A by means of a Jeffrey 48 by 72-in. vibrating feeder. This conveyor has a bend pulley at approximately track elevation which permits raising or lowering the discharge end to suit the river stage. Variable pitch idlers were used on each side of the bend pulley. A hoist-tower at the discharge end of this

conveyor contains an electric hoist placed well above maximum flood water elevation. Adjustable lugs were placed on the tower steel which serve to support the conveyor at different elevations and to furnish rigidity, thus relieving the stress in the hoist-cable. This hoist can raise the drive end of both conveyors A and B above high water level when conveyor B is retracted under conveyor A. That portion of conveyor A from the bend pulley to the track hopper is protected from water by a concrete pit and water-tight steel-work.

Conveyor Arrangement

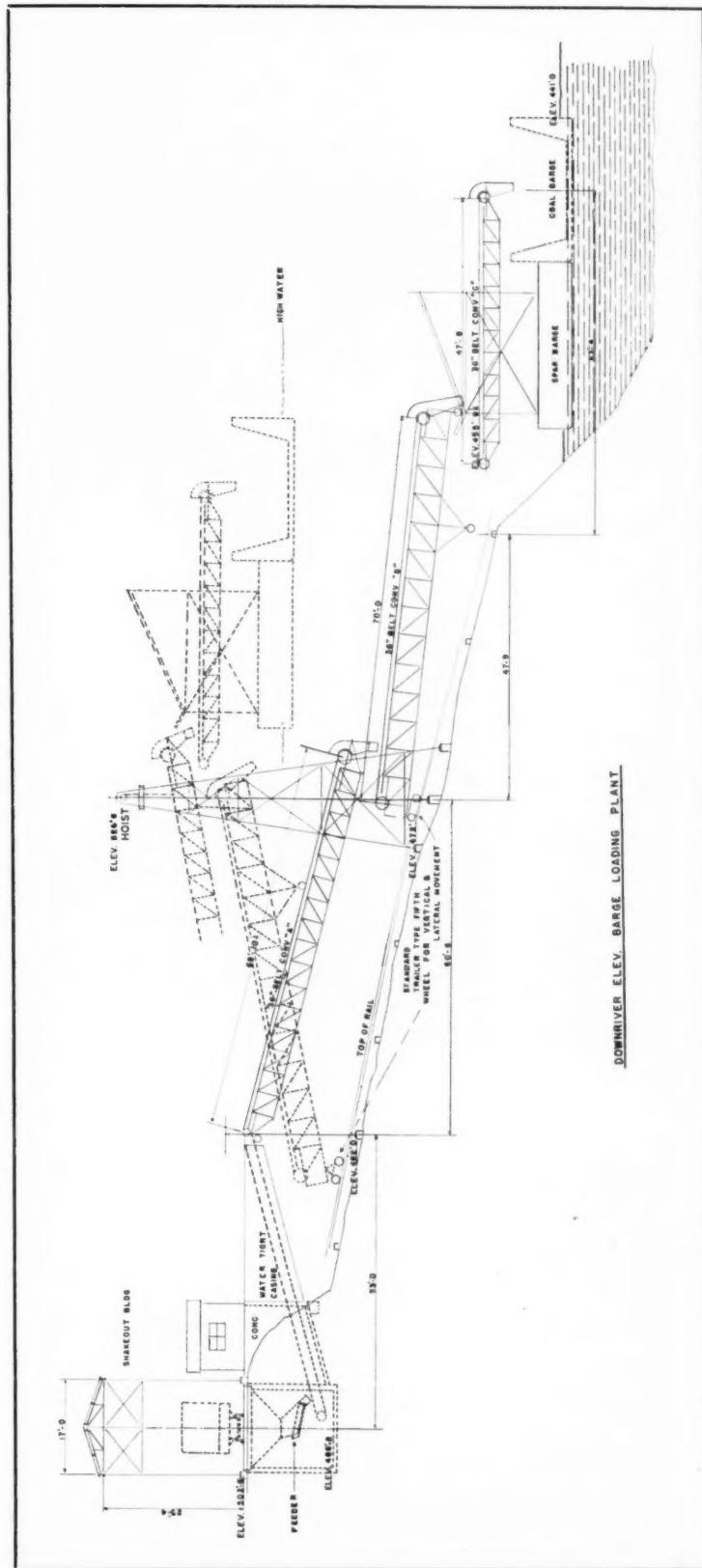
Conveyor B is a track conveyor. Conveyor C is mounted entirely on the floating spar barge. The discharge end of conveyor B rests piggy-back fashion over conveyor C and discharges onto it. The usual difficulty encountered with this type of conveyor arrangement is that when the floating dock is rammed, the track conveyor is jarred off the track. Also, unless the spar barge is exactly spotted, conveyor alignment is difficult. These factors were considered during the design period and the difficulties eliminated by providing for lateral movement on both conveyors C and B. The spar barge, conveyor C and the discharge end of conveyor B rise and fall with the river, therefore vertical motion also had to be provided for at the tail end of conveyor B. Motion in the vertical and horizontal plane were provided for about this point by using a standard trailer type fifth wheel. Four flanged wheels resting on a track provide vertical support and allow movement along the track. This dual flexibility for conveyors B and C actually permits a zig-zag flow of coal and conveyor alignment is unnecessary. Accurate spotting of the spar barge is also unnecessary.

Walkways on all conveyor trusses provide access to drives and idlers.

While the schematic drawing shows conveyor and spar barge locations for extreme high and low water stages, any intermediate stage can be handled by using conveyor B. As the spar barge rises with the water, it can be pulled shore-ward with conveyor B moving up-track. At extreme high water it can be detached from the barge, suspended from conveyor A and hoisted along with conveyor A. At this stage conveyor A would discharge directly into conveyor C. Conveyor B has wheels near the discharge end. These are used only when it is necessary to remove conveyor B from the spar barge for dredging operations or for any reason which would necessitate moving the spar barge.

Flexible Controls

The above described movements of conveyors in turn required flexibility in the wiring. This was easily accomplished by use of flexible cable and
(Continued on page 113)



Solid lines show low water operation while broken lines show position of equipment for high water operations

Recover more
salable coal at
minimum cost per ton
with **CHANCE COAL**
CLEANING EQUIPMENT



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- ... Close to 100% recovery of salable coal
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- ... Coal handled at gravities from 1.35 to 1.65 with sizes from $\frac{1}{8}$ in. to 10 in.
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STUMPED by high track replacement costs?

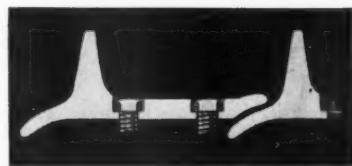
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When the going is extra tough, as in rocky areas or abrasive mineral soils . . . tractor shoe replacement can become a major cost item. Both repair time and down time eat up profits.

Switch to "the toughest steel known" . . . Amsco Manganese Steel . . . for tracks and grouser bars. Check their much longer service life against the moderate extra cost. Add to this the greater

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Amsco Manganese Steel gives excellent resistance to abrasion accompanied by impact . . . actually *work-hardens* in use. Write for full information on long-wearing Amsco Manganese Steel Tractor Shoes—the economical answer to high track-replacement costs.



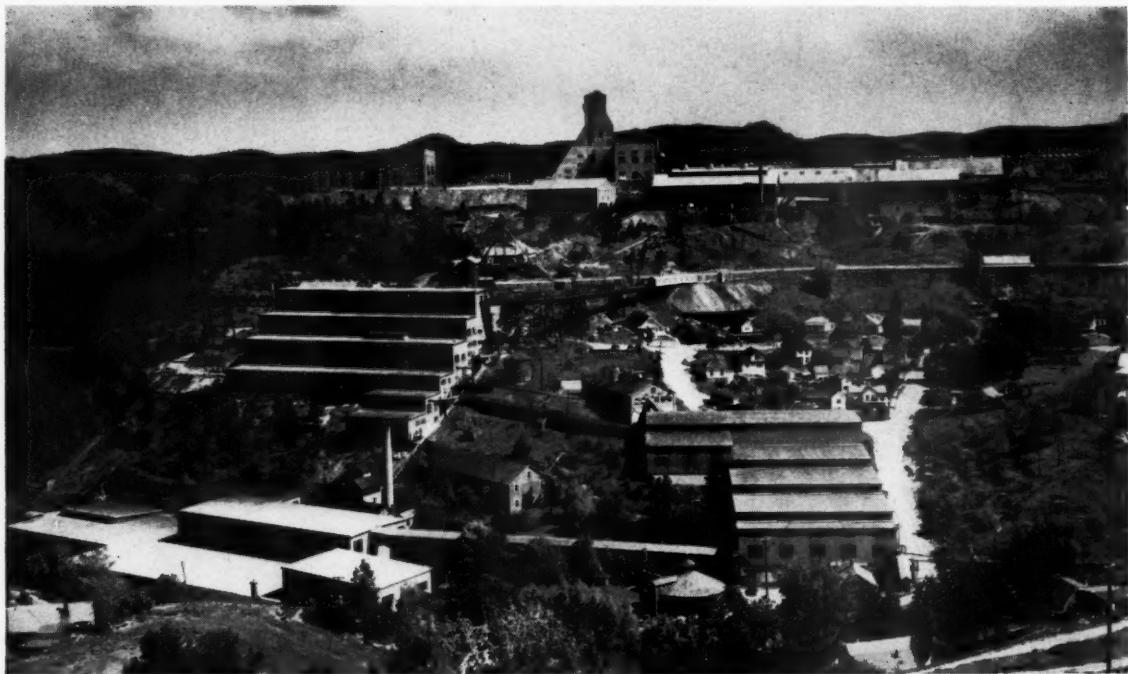
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Amsco Track Shoes have holes countersunk for less wear on bolts. Saves cost of replacing bolts when changing shoes.



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A modern gold mining operation would contribute much to our economic stability if we had a free gold market

Gold in Relation to Convertibility Of Currencies

By RAY B. WISER
Walkeng Mining Co.

A GREAT deal of economic mysticism has been built around the subject of gold in its relation to our monetary system, so that the average layman is disposed not to get involved in any discussion of it.

A few weeks ago I saw a cartoon which made quite an impression upon me. It pictured a farmer and his wife looking at a sign board. On it were drawn a number of American dollars, each smaller than the others. The first dollar was captioned 1940 and bore the label of 100 cents. The second represented a 1945 dollar, with a value of 74 cents. The third was a 1948 dollar, valued at 49 cents. The fourth dollar was for 1951, and its value was 45 cents. The fifth was a 1954 dollar with a value of 46 cents. The sixth dollar, for 1964, had no value attached to it, merely a large question mark.

Above this series of dollars was posed this query: "What Will Your Dollar Buy?" There were other statements on the sign board. One of them

read: "It takes free men at work to buy what we grow—to make what we want." Another statement read: "It takes a \$12,000 investment to put a man to work in town. There is no reason to save, to invest, to create jobs, if the dollar has no value."

This homely sign board was not couched in profound economic terminology, nor was its significant meaning expressed in the language of the academic seminar on economic theory. But it told the story which every layman could understand and apply to himself.

Influences of Stability

The issues of the stabilized dollar and its real purchasing power; of free gold as the basis of the stabilized dollar; of inflation, deflation, business cycles, alternate periods of boom and bust; of a balanced national budget; of deficit governmental financing; of sound full employment, as differentiated from alleged full employment as

a result of priming the pump; of gold in its relation to the convertibility of currencies at home and abroad—all these interwoven and inter-related issues affect all phases of our economic life and well-being. They have a distinct bearing on our domestic economy, on our relations with other nations, on exports and imports and the balance of trade. In fact, these issues exert a most powerful influence on world behavior in the direction of war or peace.

The International Monetary Fund held its 1955 annual meeting in Istanbul, Turkey. As in previous meetings, this conference again raised the question of gold in relation to the convertibility of currencies. The Fund's experts reported that we are moving toward the convertibility of currency with gold as the basis. But the rate of progress toward that goal is painfully slow. Meanwhile, the real or purchasing value of our dollar remains at less than half of its paper value. The current dollar buys only half of what it should.

True Measure of Value

One of our Presidents once remarked that our country was better off than ever before because you and I had twice as many dollars as we otherwise would have, even though each dollar was worth less than 50

cents. That statement is not sound economic reasoning because what counts is what money will buy, not how many dollars one has. And as the dollar buys increasingly less, the threat of unbridled inflation mounts higher and higher with more and more valueless dollars in circulation, none of them related to a true measure of value—free gold.

Since March 9, 1933, gold has become the most controlled of all commodities, and today is the only commodity which is held in the tight vise of a rigidly fixed price. On that date, March 9, 1933, Congress debated and passed within one single day an emergency banking act, giving the Secretary of the Treasury absolute power over gold and declaring that no gold may be privately held or dealt with except on license from the Federal Government. On that date, March 9, 1933, the price of gold was summarily and arbitrarily fixed at \$35 an ounce, with the Federal Government as the sole buyer.

Return to Gold

There it stands today, 23 years later, although in free and black markets, the price is higher. To date, every effort to repeal the act and the regulations which surround it, on the grounds that the law is unconstitutional and its premises are economically unsound, has failed. Since 1933, virtually every Republican and Democratic national platform has included planks and pledges to free gold and to institute a sound monetary system, but each national administration has seemingly repudiated the plank and pledge on which it was elected, by doing nothing about the issue.

The all-important questions that persist are: When will the United States permit a free market in gold? When will the private individual be permitted to buy, sell, produce, own and save gold? When will our cur-

A well known authority in agricultural as well as mining circles in California points out that the complexities of our economy are all based on the stability of the dollar. In turn our economy exerts a dominant influence on relations between nations—including their attitudes on peace and war. The author develops the point that, since free gold is the only proven means of stabilizing the dollar, the present system of absolute government control of price and ownership of gold is the main factor which has allowed our economy to change to the point where your dollar is worth less than fifty cents—even though the price of gold in foreign markets shows that it should be worth considerably more.

rency be converted and put back on a true gold standard? Before we discuss these and other questions, let us agree on a few basic and accredited facts. A country is on the gold standard when the unit of value and measurement of value is defined as a prescribed quantity of free gold of specific fineness. But a country can be said to be on a true gold standards only if everyone can demand gold in payment for goods sold and services rendered, and if everyone can go to a bank and exchange silver, copper, or paper money for gold.

Confiscation of Gold

Those who are on the opposite side of the economic fence claim that we are actually on a gold standard because of the gold buried at Fort Knox. There is positively and absolutely no validity in that viewpoint. Unless we can buy and sell gold, hold it and own it, save it, trade it, and use it, and exchange other money or commodities for gold, our country is not on a gold standard. The Gold Standard Act of 1934 says categorically that no currency of the United States shall be redeemable in gold. And if an American citizen has any unlicensed gold, no matter where or how he obtained it,

all of it must be confiscated and the citizen can be fined twice its value for having it in his possession.

The so-called Gold Standard Act, signed by President Roosevelt on January 20, 1934, was followed by the Silver Purchase Act of June 10, 1934, which also authorized President Roosevelt to nationalize silver. And into the guarded bastille of Fort Knox, the government poured all of the gold which it had confiscated and still is confiscating, under the guise of a monetary system which is the strangest page in American history. Today, the Fort Knox canyon theoretically holds between 22 and 23 billion dollars in gold. What is generally not known is the fact that foreigners and foreign governments own a great portion of this gold or can obtain it on a trade or exchange basis.

Privilege Granted Foreigners But Denied Americans

Including between eight and ten billion dollars in American currency, some 12 billion dollars in credit balances in our own banks, and about four billion dollars in American securities, brings the total of foreign assets in the United States to some 25 billion dollars. The strangest thing about it all is that foreigners or foreign governments are not prohibited from requesting, receiving and owning our gold instead of our paper dollars, if they so desire. But our own American citizens do not have this privilege. The legal restriction against the convertibility of currency on the gold basis applies only to our own citizens. It follows, therefore, that the gold in Fort Knox actually does not belong to us, if foreigners or foreign governments decide to ask for it. If that is true, what, then, is the security or collateral underneath our printed currency?

When a country circulates all the money it can print, the value of the currency goes down, and prices go up. Gold is not an absolute brake on prices, but experience has proved that one of the effects of a sound monetary system, based on the convertibility of gold, is to stabilize prices. Gold is



A gold dredging operation of twenty years ago

not only our best and most lasting medium of exchange, but is also a commodity used in industry, medicine, jewelry, dentistry, and the arts. As a medium of exchange, it is the only known universally accepted specific measure of values. Moreover, it is the basis or fundamental key to all media of exchange. In other words, all other media or methods of exchanging goods or obtaining services, whether with silver, copper, printing or paper money, or on credit, must be based on one fundamental universally adopted and accredited measure or standard of value, which historically has been and will continue to be gold.

Managed Currency

The late Dr. E. W. Kemmerer once stated: "Although there are many types of the gold standard, the (true) gold standard may be said to exist in any country in which prices of goods and obligations of debtors are usually expressed in terms of the value of a monetary unit consisting of a fixed quantity of gold in a free market." Dr. Benjamin M. Anderson wrote many years ago: "The first rule of the gold standard is to pay out gold on demand." Both Dr. Kemmerer and Dr. Anderson advocated full and complete convertibility of gold in its relation to and as the basis for our currency. These two eminent economists agreed that the United States is not on a gold standard, despite all statements to the contrary; and that its monetary system represents a managed currency, vested in the Treasury Department and in the Federal Reserve Board.

Generally speaking, there are two schools of thought concerning the restoration of currency convertibility. One school regards the restoration of convertibility chiefly as a matter of curbing inflation abroad; and holds that the disturbances in production and trade, caused by war, are temporary phenomena which have now been surmounted. If this reasoning applies, all that remains to be done, in order to obtain full convertibility, is to institute appropriate monetary, fiscal and exchange rate policies.

The second school of thought regards the problem of convertibility as much more complicated. While agreeing that curbing inflation and fixing appropriate exchange rates are essential to convertibility, it argues that such measures are not enough to produce the desired results. This school of thought brings into the picture the large issue of international multilateral trade and the maintenance of balanced trade relations in a worldwide free market. Along this line, it is refreshing to read the 1955 annual report of the International Monetary Fund, which states:

"In the course of 1954 and the first half of 1955, further considerable progress has been made in the direc-

tion of freer and less discriminatory trade, on the basis of freer and more multilateral payments arrangements. There has been a continuation of the movement noted in the previous year, when—in response to an expansion of world trade and a movement toward a more satisfactory balance in the payments positions of many countries—steps were taken, both in Western Europe and elsewhere, to relax the restrictions previously imposed, for balance of payments reasons, on imports, on currency transfers, and on dealings in foreign exchange.

"Some of these measures were of no great significance if they were considered in isolation, but their result in the aggregate contributed to a substantial improvement in interna-

formula that volume times price minus costs equals net profits or net losses. They know that their production must have an outlet at a fair return to them. Storing pyramiding surpluses of agricultural surpluses, at a terrific cost to the government, is certainly no solution of the farm problem.

The Secretary of Agriculture is helpless in his futile attempts to solve the agricultural problem so long as he is subject to the whims of those who control the rates of currency exchange, the money flow, the lending capacity, the dollar supply, and other phases of our present managed currency. This has been demonstrated during the term of the present Administration to a greater degree than ever before, under the "hard" and "soft"



Precious metals assay laboratory at the Kennecott Research Center

tional economic and financial relations. Many countries have shown a determination to advance, step by step, toward the liberation of trade and currency convertibility, and the environment created by the international payments situation has been favorable for these advances."

The Farm Problem and Currency Exchange

The current farm problem, which is becoming more and more aggravated, and causing great concern, not only to our farm people because of the drop in the agricultural income, but to the Administration, because of its political threat, would largely solve itself if our foreign trade were restored to normalcy. The lack of convertibility has all but stopped the flow of goods and their resultant services from and to the United States. Our farm people are practical. They dislike regimentation and interference with their pursuits. On the other hand, they know full well the meaning of the simple

money policies which have been turned on and off at the whims of our money managers, who apparently have no managers to manage them. The farm problem, which is irrevocably tied to foreign markets and exports, cannot be solved by such meaningless phrases as "full parity in the market place," but must be resolved through means which permit the sale of our agricultural commodities in the markets of the world.

Government's Attitude

The Republican platform of 1952 promised "sound money" and an "honest dollar," and stated that its aim was to put the dollar back "on a fully convertible gold basis." Instead of carrying out its pledge, the Administration has constantly blocked its activation. Three of the Administration's top echelon, the Secretary of the Treasury, the former director of the Federal budget and currently, the Deputy Secretary of the Treasury, and the Chairman of the Board of Gover-

nors of the Federal Reserve System, have advised Congress that there is no need right now of making our dollars convertible into gold; that there is now "universal confidence in the dollar"; that no threat of inflation exists; that we should not consider a gold standard until the major nations are ready for it; that while gold payments are the seal of approval of good money, the United States should not try to achieve that standard because the rest of the free world has not reached this goal.

How these three officials can subscribe to the views they have expressed, I do not know. At the time the Deputy Secretary of the Treasury testified before the Senate Committee on Currency and Banking against the Administration's pledge to put the dollar back on a fully convertible gold basis, he put into the record the following statement issued by the Federal Commission on Foreign Economic Policy: "Convertible currencies constitute an indispensable condition for the attainment of world-wide multilateral trade and the maintenance of balanced trade in a relatively free market."

To add to the confusion, the Deputy Secretary of the Treasury included in his prepared brief to the Senate Committee the following unique statement: "Since the removal of unnecessary restrictions on the citizen is a steadfast objective of this Administration, we are reviewing the restrictions concerning gold, in an endeavor to find ways in which we may reduce the administrative burdens which they impose on individuals and firms." The Secretary of the Treasury, himself, in a letter which he wrote to United States Senator William F. Knowland, commenting on the proposals for monetary changes which I had submitted to Secretary of Agriculture Ezra Benson, said: "It is hard to disagree with a considerable part of Mr. Wiser's analysis of our problem. The most important thing about money is stability, and we here in the Treasury are, for that reason, vigorously opposed to any change in the present gold content of the dollar."

Effects of Sound Money

A sound money policy affects all phases of our economic life. The converse is likewise true. A nation's money policy is closely related to production on the farm, in the mine and in the factory; to agricultural and industrial sales, at home and abroad; to commodity prices, to the behavior of the stock market; to investments; to interest rates and their influence on business expansion or contraction; to the market price and value of government bonds; to exports and imports; to employment and unemployment; to wage rates and the wage-earner's purchasing power; to living standards; to the entire nation's economic health, in all of its ramifica-



Controlled prices have virtually eliminated the gold prospector

tions; and to the country's politically organic future, in its broadest sense.

In other words, if the money policy underneath our economy is sound, it will maintain an ever-increasing service structure above it. If the money policy underneath our economy is not sound, the structure above it is in jeopardy. And that is one condition this nation cannot afford, for reasons which are too obvious. As everyone knows, we have enemies within as well as outside of our gates.

What do I mean by the phrase, "a sound money policy"?

1. A sound money policy should be neither "tight nor hard"; neither "soft nor liberal." It should not fluctuate from one extreme to the other. It should not represent either "hard" money nor "soft" money. A sound and stable money policy should be geared to a definite medium of exchange, completely free from all "managed" controls, rationing, restrictions of its free usage, and various other governmental prohibitions and inhibitions.

2. A sound money policy should define the character of the standard upon which it is based, which in our case is gold; and should establish the American paper dollar in terms of a fully convertible gold basis. A sound money policy should establish gold as the common denominator for determining an exchange ratio. This gold should have a value that reflects truly current wage and commodity price levels. Our stockpile of gold should be the basis of the issuance of our paper money; our credit; the size of our national debt; governmental budgets; governmental spending; the volume of "money" in circulation; the character of our interest rates—all on a completely free or "unmanaged" basis; that is, not subject to manipulation in one direction or another.

3. Ultimately, the convertibility of our own gold and its freedom from a governmentally managed currency, should extend to the English pound sterling, the German mark, the French

franc, and to the currencies of all of our allies in the fight for economic and political freedom; in the fight against totalitarianism.

Free-Enterprise

Economic freedom is just as significant as political freedom. One supplements the other. We cannot have political freedom without all of the other freedoms attached to it. All of us believe in a free-enterprise economy. That means competitive enterprise for all commodities, all production, all distribution, all investment.

A free-enterprise economy rests upon a foundation of a sound money policy. If we do not believe in a managed economy why should we have a managed currency? These two opposites are paradoxical. If we restore gold to a fully convertible basis, other freedom-loving countries will do the same. Free Germany already has done it. England is thinking about doing it. France is sympathetic to the program.

Our five major objectives are:

1. Provide a free market for gold so it will find its proper price level based upon demand at home and abroad.

2. Provide an unhampered privilege of possession and trading in and with gold.

3. Provide a fully convertible currency to and from gold, based on values that reflect today's price levels for other commodities.

4. Restore gold as the common denominator in the world's currencies with free conversion privileges to allow for maximum trade.

5. Prohibit the Federal Government from selling gold to industry, the arts, the medical, dental, and other professions at a fixed price.

A sound money policy will enable the United States to accelerate and perpetuate its leadership throughout the free world.



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Cutting drilling costs takes three things — quality drill steel, good shop practice, and care in the field.

The requirement of quality steel has been well taken care of by new *alloy* rods — Crucible CA DOUBLE DIAMOND and 4E Hollow Drill Rods. But even the best, toughest steel requires some care.

Take, for example, FORGING AND HEAT TREATING



Outside of breakage caused by down-right *abuse*, most hollow drill rod failures are caused by improper forging or heat treating.

Failures due to heat treatment are generally fatigue failures occurring in the region of the rod where the forging, normalizing or hardening heat runs out. This is the "soft-zone" between the part of the rod that is heated to the desired temperature and the part that remains cold. To eliminate unnecessary failures, it is important that manufacturer's data

sheets or field representative's recommendations be followed closely.

ANNEALING — If any forging is performed prior to machining, the end should be allowed to cool in air until black. It should then be reheated to slightly above critical temperature and allowed to cool slowly in a good insulating material such as mica or ground asbestos.

A good practice is to put the rods in the insulation early in the afternoon, and allow them to cool slowly until the next morning. When the rods are removed the ends should still be too hot to handle comfortably with the bare hands.

As a leading producer of drill steels, and other special purpose steels, Crucible welcomes the opportunity to work with you in solving problems as they arise.



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Wheels of GOVERNMENT



As Viewed by HARRY L. MOFFETT of the American Mining Congress

INCREASING grumbling over progress being made on the legislative program before Congress is being heard under the Capitol dome. Some members, particularly in the House, are openly labeling the 84th Congress a "do-nothing Congress" declaring that it is proceeding at a snail's pace in the consideration of major legislation. The charges are reminiscent of those made by former President Truman on the activities of the 80th Congress during the presidential campaign year of 1948.

The leadership of both parties are concerned at the slow pace evidenced on House and Senate floors, but point out that congressional committees are hard at work grinding out measures which will be reported for debate in the months ahead. Indications are that Congress will be in for a grueling grind during the hot Washington summer if it is to adjourn by the end of July or mid-August.

Both Houses will take an Easter recess from March 29 until April 9. Nothing except routine legislation and some appropriation bills are scheduled for action before the holiday.

Tax Reduction Ruled Out

Any chance that the Administration might reverse its stand and seek a cut in personal income taxes at this session of Congress has been ruled out by Treasury Secretary George Humphrey. He flatly told reporters recently that there are "absolutely no prospects" for any tax reduction this year. He said the Administration had great hopes for balancing the budget and that any surplus should be applied to reduction of the national debt.

Congress, too, appears to be reluctantly accepting this viewpoint. Senators George (Dem., Ga.) and Byrd (Dem., Va.), both powerful figures on the Senate Finance Committee, have made it plain that they know of no move to add a cut in personal income taxes to a House-passed bill to extend present corporate income and excise rates. It had been anticipated that efforts would be made to amend any tax measure to provide

reductions in personal income taxes in this election year. Such attempts may still be made if the April 15 income tax collections show that a substantial surplus of revenue will accrue to the Federal Government.

The House approved by a 366 to 4 vote the measure embodying President Eisenhower's recommendations that there be no drop in the present excise or corporate income tax rates. The bill would keep corporate tax rates at the 52 percent level until April 1, 1957, and would continue present excise rates on liquor, gasoline, beer and wine, cigarettes, autos and trucks. Limited hearings on the bill are expected by the Senate Finance Committee and early Senate approval is anticipated. Senator Fulbright (Dem. Ark.) and a number of other Senators have initiated a drive to provide tax relief for small business firms. They will seek to write into the bill provisions reducing from 30 percent to 22 percent the tax rates on net profits up to \$25,000 a year, and increasing the "surtax" on income above \$25,000 from 22 to 30 or 31 percent.

Residual Oil Import Increase Shelved

The domestic coal and oil industries won a real victory early in March when the President's Cabinet Committee on Energy Supplies and Resources Policy shelved a proposal by the Office of Defense Mobilization to permit a 10 percent increase in residual oil imports through April 30. Determined efforts on the part of the coal industry were largely responsible for this action.

ODM Director Arthur S. Flemming told reporters that the President's Committee had also agreed to review the supply-demand outlook for residual oil for next winter and to make an up-to-date finding of compliance with its November 1955 request for a 7 percent reduction in crude imports from all areas but Canada and Venezuela. Flemming heads the Cabinet group.

He also said that the Cabinet Committee would shortly make a decision

Washington Highlights

TAX REDUCTION: Ruled out
PROPOSED OIL IMPORT INCREASE: Shelved

FREIGHT RATES: ICC approves 6% hike

BARTERED MINERALS: To be "locked up" in stockpile

HIGHWAY PROGRAM: Nears debate.

DEFENSE PRODUCTION ACT: 2-year extension probable

WATER POLLUTION CONTROL: House Committee revamps bill

MINERALS PROGRAMS: Congress takes initiative

OTC: Under heavy fire

on the need for a long-range residual oil program to build up stocks for consumption next winter. He indicated that the Committee had found an improvement in compliance by importers with the 7 percent cutback request made last Fall. All importers have been reporting monthly to ODM on planned imports.

Freight Rates Increased

The Interstate Commerce Commission has granted a general 6 percent increase in freight rates but has exempted coal, coke and several other commodities from the full increase. The new rates became effective March 7. It denied the carriers' plea that the general rate increase be set at 7 percent, declaring this proposal to be unreasonable. The rate increases are final and are not subject to possible refunds as proposed by the railroads in their initial petition.

The ICC order increased line haul rates on anthracite, bituminous coal, and coke in carload lots by 6 percent subject to a maximum of 15 cents per net ton. This maximum applies to tidewater rates to North Atlantic ports for export or inside-harbor or

inside capes destinations. Otherwise, on coal and coke moving by rail-water, the increase in the rail rate may not exceed 8 cents per net ton from the mine origin to the first port and 7 cents per net ton from the second port to destination. Rates on lignite coal were increased 3 percent subject to a maximum of 7 cents per net ton.

The ICC order also provided that increases in rates on phosphate rock including phosphatic clay are subject to a maximum increase of 30 cents per ton, and that a maximum increase of 50 cents per ton may be applied to muriate of potash, sulphate of potash and sulphate of potash magnesia.

Barter Agreements Strengthened

The Senate, after extensive and heated debate, has approved a patch-work farm bill which may not be at all to the Administration's liking and which, if sent to the White House in its present form, may be headed for a presidential veto.

One provision of this measure is of real significance to the domestic mining industry. This provision, which did not appear in the House-passed bill but was added by the Senate Agriculture Committee, would require that strategic materials acquired by the Commodity Credit Corporation as a result of barter or exchange of U. S. surplus agricultural products (unless acquired for the national stockpile) must be transferred to the "supplemental stockpile" created under the Agricultural Trade Development and Assistance Act of 1954—under which their disposal would be subject to the same restrictive provisions that apply to material locked up in the national stockpile. This would prevent sale of these materials in the domestic market with resultant depressive effects. Under existing law the Commodity Credit Corporation has the right to dispose of the materials received in exchange for agricultural products in the open market, although it has been the Administration's policy to transfer them to the national stockpile.

Since the new provision had Administration backing it is likely that House-Senate conferees will include it in the final version of the measure that is sent the President. Should the bill Congress enacts be vetoed, however, passage of a new law would be required to remove this Damocles sword from over the head of the domestic mining industry.

The magnitude of business involved in this barter of surplus agricultural commodities can be seen from a report of the CCC for the October-December 1955 period. During this quarter strategic and other materials delivered by barter contractors against open contracts had a value of \$30.5 million as compared with deliv-

eries worth \$26 million in the July-September 1955 period. CCC currently will consider barter proposals for aluminum, antimony, asbestos, bauxite, cobalt, copper, beryl ore, cadmium, chromite, manganese ore, mica, nickel, platinum, palladium, selenium and talc.

Highway Program Nears Debate

Legislation to provide for the long-range highway construction program will probably reach the House floor for debate shortly after the Easter recess.

The House Ways and Means Committee has approved a bill providing for an annual license fee of \$1.50 for each thousand pounds of truck weight on trucks weighing 26,000 lbs or more, and for increases in the existing taxes on gasoline, diesel fuel, special motor fuel, tires, camelback used in retreading tires, and in the excise tax on trucks, truck trailers, and busses. The increased taxes, according to announcements by the Committee, would apply only to highway type vehicles. However, any vehicle used in mining operations which is of the "highway type" would be subject to the increased taxes despite the fact that it might never be used on the roads. The American Mining Congress and other mining organizations had strongly urged that off-highway vehicles used in mining operations be exempted from the increased levies.

Meanwhile, a House Public Works Subcommittee is putting the finishing touches on the measure authorizing the 40,000-mile road net and the expenditure of \$24.8 billion over a 13-year period for its construction. Under terms of the bill, the Federal Government will finance 90 per cent of the cost with the remainder to be supplied by the States.

A hassle may develop over this measure before it is sent to the floor. An amendment has been adopted by the subcommittee which would make the Davis-Bacon Act applicable to the highway program. Under terms of that Act, the Secretary of Labor has authority to establish prevailing wages, hours, and conditions of employment on Federal projects. Strong opposition to this move will be registered by Southern Congressmen, who claim that it would set a precedent applicable to local road building that is not now under Federal wage and hour regulation.

The two bills will probably be merged into one before final House approval.

Defense Production Act Extended

Following brief hearings at which top Government officials advocated further extension of the Defense Production Act, the House Banking and

Currency Committee sent to the House a measure calling for renewal of the existing law for an additional two years from June 30. The Committee refused to eliminate from the Act a provision requiring business men serving the defense agencies without compensation to make a full disclosure of their private financial affairs. Commerce Secretary Weeks had urged that this requirement be dropped from the law.

As approved by the Committee the measure would continue for two years the present authority for long-term mineral purchases, financial assistance for expansion of production and for exploration and development of mineral deposits, allocations and priorities for defense needs, and amortization of facilities for defense purposes.

Officials on Capitol Hill are of the opinion that the bill will encounter little difficulty and will be sent to the White House in its present form.

Water Pollution Hearings

The House Public Works Committee is holding hearings on measures which would extend the Water Pollution Control Act for a five-year period and provide an annual appropriation of \$2 million for grants to States and interstate agencies to aid them in abating pollution.

Before the Committee is the Senate-passed bill, which had previously been amended by the Committee and sent to the House floor last July, but which was recalled to give consideration to suggested amendments proposed by Federal and State agencies. Also before the Committee is a new measure introduced by Rep. Blatnick (Dem., Minn.) which incorporates some of the views expressed by these agencies. The Blatnick measure is similar to the Senate version but differs in that the Surgeon General would be authorized to make grants to States or municipalities for the construction of necessary treatment works and the enforcement proceedings would be broadened to make the appropriate State water pollution control agency a party to any abatement suit brought by the Federal Government.

Blatnick's measure, however, does not contain one feature of the existing law which provides that prior to entering judgment in abatement proceedings, the Court having jurisdiction must give due consideration to the practicability and to the physical and economic feasibility of securing abatement of any pollution proved. The American Mining Congress has made strong representations for the inclusion of this highly important provision.

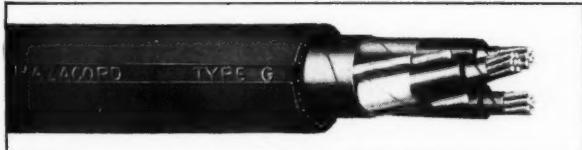
The Committee expects to conclude its hearings shortly and bring a revised version of the bill to the House

(Continued on page 121)

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Continuous miners claw through a seam with amazing speed. That is, until there's a cable failure. Then you have a continuous loafer—an expensive piece of equipment to have lying around doing nothing. Get that loafer going again by introducing him to Hazacord, then they'll both be "going steady."

Hazacords are especially designed for continuous mining machines, either a-c or d-c operation. Insulation is heat- and moisture-resistant.



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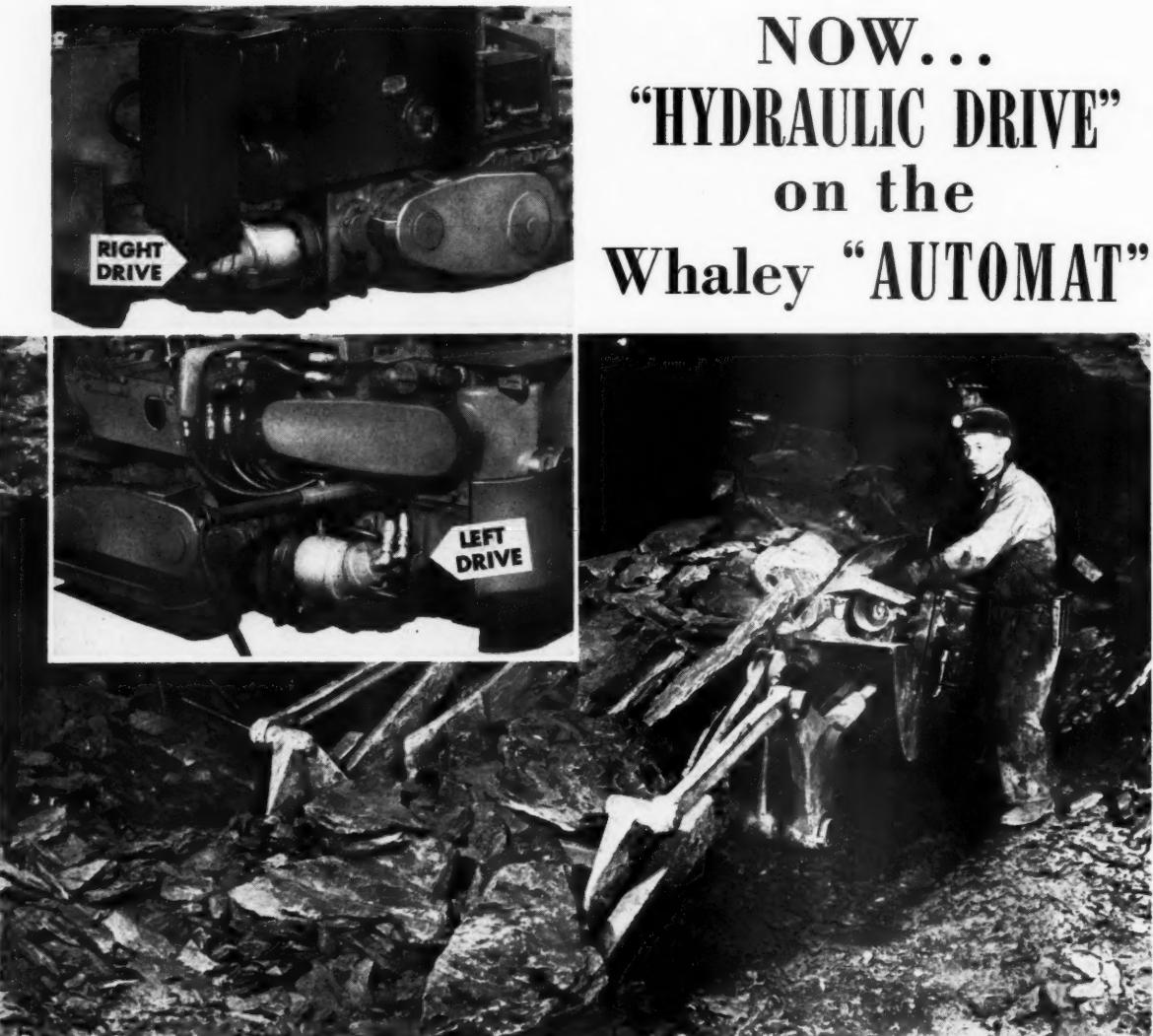
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Now you can have a Crawler Type Loading Machine with a new, revolutionary Hydraulic Drive Mechanism.

No other loader has ever approached the mechanical endurance of the Whaley Automat for consistant, economical, year-in, year-out service for rock loading. And now with its new Hydraulic Drive, you have available the most efficient, smoothest operating, trouble free off track loader for heavy duty rock work ever produced. Right and left Crawlers are independently operated by finger tip controls and at variable speeds from 50 to 100 feet per minute. Clutches and brakes have been eliminated.

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IMPORTANT: For those mines now equipped with Whaley "Automats" . . . conversion to our new Hydraulic Drive is readily available. One leading mine is now converting four of their machines.

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Personals

Cerro de Pasco Corp. has announced two personnel changes in its mining organization. **Harold B. Ewoldt** has been made assistant to the president for mining matters and **Horace W. Higgs** has been made assistant manager of operations for the corporation.

Before joining Cerro de Pasco, Ewoldt served as vice-president of



H. B. Ewoldt



H. W. Higgs

Copper Range Co., and as manager of the zinc division of Calumet & Hecla, Inc.

Higgs formerly was assistant general superintendent of smelting and refining. He joined Cerro de Pasco in 1949 after working with American Smelting and Refining Co. as metallurgist at that company's East Helena, Mont., lead smelter. Higgs will continue in residence at Oroya, Cerro de Pasco's smelting and refining center in the Central Peruvian Andes.

Appointment of Dr. Arthur A. Baker as associate director for the Geological Survey was announced. Dr. Baker has served as administrative geologist in the office of the director since June 1953.

Retirement of Blair L. Sackett, metallurgical manager of Tooele smelter operations for International Smelting & Refining Co. has been announced. Carlos Bardwell, general superintendent of the Tooele plant, succeeds Sackett.

Other organizational changes are as follows: G. A. Burt, formerly ore buyer for IS&R, became assistant to the metallurgical manager at Salt Lake City; W. J. McKenna, former assistant general superintendent, was advanced to general superintendent at Tooele; E. W. Steinbach, former lead plant superintendent, was named assistant general superintendent of all

Tooele plant operations; and T. W. Saylor, former assistant lead plant superintendent, was named lead plant superintendent.

Ernest V. Bowman has been appointed general superintendent of Winding Gulf Coals, Inc., mines in Raleigh, Wyo., and Mercer counties in West Virginia. Succeeding Bowman as mine superintendent of the Gulf No. 4 mine is **Clyde H. Hill**, who was promoted from general mine foreman. **Blaine Poe**, formerly assistant general foreman, replaces Hill.

Charles E. Prior has been named consulting mining engineer to Western Gold and Uranium, Inc., and its subsidiary, Golden Crown Mining Co. The two companies are developing uranium, silver, copper, lead and zinc properties in Arizona and Utah. Prior had been with American Smelting and Refining Co., where he was resident engineer in the Mining Department in New York.

Lillybrook Coal Co. has announced that **Walter England**, formerly general mine foreman, has been promoted to superintendent of the company's Killarney mine.

J. Louis Reynolds, vice-president of Reynolds Metals Co., was recently elected executive vice-president of the company.

Dr. Milton H. Fies has received the Conservation Award of the U. S. Interior Department for "valuable service" in connection with conservation and economic use of coal resources.

The award was made February 13 to Fies who is vice-president in charge of coal operations of the Alabama Power Co. The Interior Department made the award because efforts of Fies had contributed immeasurably to the progress and success of the studies of underground gasification of coal at Gorgas, Ala.



John M. Warde has been transferred from Oak Ridge National Laboratory to Union Carbide Ore Co., a division of Union Carbide and Carbon Corp. Dr. Warde's new duties will be concerned with raw materials problems.

MCJ Enlarges Staff

THERE is another new face around the editorial office of 'Mining Congress Journal.' Glenn F. Jackson has joined the staff as assistant editor.

Glenn has long been associated with mining in the western United States, having been born in Colorado into a family of coal miners, and raised in Carbon County, Utah. He received his Bachelor of Science degree in mining from the University of Utah and a Master of Science degree in civil engineering from the University of California at Berkeley.

During World War II Glenn served with the 11th Airborne Division of the U. S. Army as a 1st lieutenant. He has had a wide variety of experience in both the engineering and operating phases of mining, having worked as a miner, face boss, assistant night foreman, night foreman and assistant engineer. His primary field of interest while earning his M.S. was concrete design with particular emphasis on prestressed concrete.

We are happy to have Glenn join our staff and know that our wide circle of readers will benefit from his broad background of technical training and practical experience.



Glenn F. Jackson

Robert Lee Vines was recently appointed assistant to the chief of the Department of Mines and Minerals for the State of Kentucky.

Roland D. Parks, Associate Professor of Mineral Industry at Massachusetts Institute of Technology, recently returned from Dhanbad, Bihar,

India where he was guest Professor of Metal Mining at the Indian School of Mines and Applied Geology from February 1955 to the end of the year. His trip was sponsored by the University of Wisconsin under the point four program for interuniversity education. Dhanbad, located 160 miles west of Calcutta, is in the Jharia coal

field, which afforded Parks the opportunity to visit many of India's mineral producing areas.

John G. Dean, chemical and metallurgical consultant, Tuckahoe, N. Y., has been retained by Climax Molybdenum Co. to advise on the company's recently expanded chemical program.

— Obituaries —

Bertram Chesleigh Hylton, 69, retired general manager of the Lake Superior Coal Co. at Superior, W. Va., died February 16.

In ill health for several months, Mr. Hylton retired last June. He joined Lake Superior as general manager in 1914.

Earl W. Pinney, 64, died in Salt Lake City February 14. Mr. Pinney for 20 years was chief engineer of the Garfield smelter of the American Smelting and Refining Co. He also built a smelter for AS&R at the Cerro De Pasco mine in Peru.

Marden W. Hayward, 73, widely known in Western United States and Mexican mining circles, passed away

in El Paso, Tex., February 4.

Mr. Hayward was a consulting mining geologist for the American Metal Co. He had long been associated with the American Mining Congress and was particularly active in the AMC Convention held at El Paso in 1947.



tirement at the end of 1954. Mr. Steele was also president of the Compania Minera de Penoles, S. A., Cia. Metalurgica de Penoles, S. A., Monterrey, Mexico; Southwest Potash Corp., Carlsbad, N. M.; and an officer and director of other subsidiaries of The American Metal Co.; and a director of the Rhodesian enterprises in which the Metal Company is interested. He was also chairman of the Tsumeb Corp. Ltd., Tsumeb, South West Africa, on its organization in 1947 until his retirement in 1954.

By his imaginative leadership Mr. Steele contributed substantially to the growth of The American Metal Co. during the period of his connection with it. He played a large part in the evolution of the company's operations in Mexico and of its copper and by-product refinery at Carteret, N. J. Mainly on his initiative occurred the development of the Pecos Mine, owned jointly by the Metal Company and David M. Goodrich and associates, which became a large producer of zinc and lead during the 1920's and 1930's. Mr. Steele was primarily responsible for the inception of the Metal Company's potash enterprise at Carlsbad, N. M., and the exploration program which led to the Metal Company's discovery in 1954 of the lead-zinc-copper-silver ore bodies in New Brunswick, Canada, which have since been named in Mr. Steele's honor.

Melvin Henry Ott, 28, mineral engineer at the Hanna Coal Co. died February 14 in Wheeling, W. Va., of a heart attack.

Raymond L. Walsh, 65, retired assistant vice-president and chief engineer of Universal Atlas Cement Co., died February 22 in New York after a brief illness.

Mr. Walsh, who had been associated for more than 30 years with the cement company, a U. S. Steel Corporation subsidiary, retired on December 31, 1955. He had been importantly connected with the company's engineering and new construction program for many years and upon retirement had been retained by the company in a consulting capacity.

A native of Chicago, he joined Universal Atlas at Chicago in 1925 as

assistant electrical engineer, became electrical engineer in 1929, assistant chief engineer in New York in 1944, chief engineer in 1953, and was appointed assistant vice-president and chief engineer on February 1, 1955, in which capacity he served until his retirement.

Daniel Cowan Jackling, 86, founder of Utah Copper Co., internationally known mining engineer and industrialist, died March 13. He had suffered from a circulatory ailment since Christmas.

Holder of numerous awards for achievement in mining and engineering fields, and the Distinguished Service Medal for outstanding effort during World War I, Mr. Jackling was credited with pioneering and developing the processing of low-grade porphyry copper ores. This monumental work is today responsible for more than 85 percent of the Nation's production.



A man of tremendous energy and ability, Mr. Jackling served successively as director and/or general manager, managing director, vice-president and, for about 20 years, as president of the following mining and metallurgical corporations: Utah Copper Co., Nevada Consolidated Copper Co., Ray Consolidated Copper Co., Chino Copper Co., Nevada Consolidated Copper Corp., Gallup American Coal Co., and the corporate subsidiaries of these.

He held similar offices also with the Butte and Superior Mining Co., Alaska Gold Mines Co., Grandby Consolidated Mining Co., American Zinc, Lead & Smelting Co., Mesabi Iron Co., and numerous other industrial corporations.

Mr. Jackling also served as a director of Braden Copper Co., and director of mining operations of the Kennecott Copper Corp. He retired as an officer and director of all the foregoing industrial corporations during or before 1942, except the Mesabi Iron Co., of which he remained president and director.

An Appreciation

By HAROLD K. HOCHSCHILD

HEATH McCLUNG STEELE, 71, died in New York City on February 21. He had been in poor health for about two years.

Born in Knoxville, Tenn., in 1884, Mr. Steele was educated at the Baker-Himmel School and the University of Tennessee. After practical mining experience in Tennessee, Virginia and Nevada, he became associated with J. R. Finlay in 1911 as consulting engineer, with headquarters in New York. In 1917 Mr. Steele joined The American Metal Co., Ltd., and soon afterwards took charge of its Mexican operations. In 1923 he became a director of the American Metal Co., with headquarters in New York, and in 1930 he was elected vice-president. He occupied both offices until his re-



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Roof falls, resulting in injury and loss of production, are less likely when you use roof bolting, with Bethlehem's square-head roof bolt. This method of roof support promotes safety because it anchors overlying rock. What's more, roof bolting offers these other worthwhile advantages: (1) improved ventilation, due to the absence of bulky supports, (2) increased production through greater freedom in operating mechanized equipment, and (3) less need for storage space, both above and below ground.

Used with Expansion Shell

The Bethlehem square-head roof bolt owes its positive locking action to the leaf-type malleable-iron shell with which it is used. When the bolt is tightened, the leaves of the shell expand, providing a firm four-way grip against the sides of the hole. A square roof plate provides additional support. A hardened washer, furnished with the assembly, reduces friction between the bolt head and roof-plate.

Bethlehem also manufactures a 1-in.-diam slotted roof bolt, used with a steel wedge. This bolt, because of its larger diameter, is ideal where maximum strength is required. It is also suitable for pillar bolting. When installed, the wedge is driven into the 6-in. forged slot, spreading the bolt-ends to fill the hole.

If you would like to consider a roof-bolting program, we suggest you would find it worthwhile to talk with a Bethlehem representative. Just get in touch with our nearest sales office.

TYPE	DIAM	TYPICAL BREAK LOAD, LB
Carbon	3/4 in.	24,000
High-Strength	5/8 in.	24,000
High-Strength	7/8 in.	45,000

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BETHLEHEM STEEL





H. DeWitt Smith



R. Livingston Ireland



George M. Humphrey



Louis Shattuck Cates

The Institute's 1955 president H. DeWitt Smith, Director of Newmont, Phelps Dodge, and St. Joseph Lead, was awarded the Charles F. Rand Medal. R. Livingston Ireland, Chairman of the executive committee of Pittsburgh Consolidation Coal Co., received the Erskine Ramsey Gold Medal for achievement in Coal Mining. Honorary Memberships in AIME were presented to Secretary of the Treasury George M. Humphrey and to Phelps Dodge Board Chairman Louis Shattuck Cates

AIME New York Meeting

Annual Convention A Huge Success

THE American Institute of Mining, Metallurgical and Petroleum Engineers held its annual convention at the Statler Hotel in New York on February 19 through 23. The meeting drew an attendance of more than 3000, as educators, operators, executives, economists and technicians from all phases of the mineral industries gathered to hear their colleagues present authoritative papers on many mining subjects.

H. DeWitt Smith, retiring president of the Institute, presided over the welcoming luncheon Monday noon. The main talk at this luncheon was by Jesse C. Johnson, director, Division of Raw Materials, Atomic Energy Commission, who gave an excellent review of the uranium mining industry, describing its early stages and its development to the present day. The uranium industry, he said, has grown to the point where he can no longer see a problem in supplying future uranium requirements for peace or war.

Social Activities

A pre-smoker cocktail party on Monday evening began a series of enjoyable activities on the lighter side. The stag smoker-dinner which followed was marked with congeniality and featured a fine meal and a slate of top notch entertainers. The M. B. D. Scotch breakfast on Tuesday morning came off in traditional good fashion with a good deal more scotch talk than scotch consumption. Other divisions had their own breakfast, luncheon or dinner meetings and ample time was left for miners to see the big town. The social highlight, of course, was the annual banquet and president's reception at the ball-

room of the Waldorf-Astoria. This included the formal presentation of awards, followed by dancing into the small hours.

Awards

The Charles F. Rand medal was awarded to Henry DeWitt Smith "For distinguished achievement and inspired leadership in the administration of all phases of the mining industry at home and abroad, in peace and in war, throughout a long and distinguished career." R. Livingston Ireland was awarded the Erskine Ramsey gold medal with the citation, "For his vision, energy, and consistent courageous belief in and leadership of the American Coal Industry."

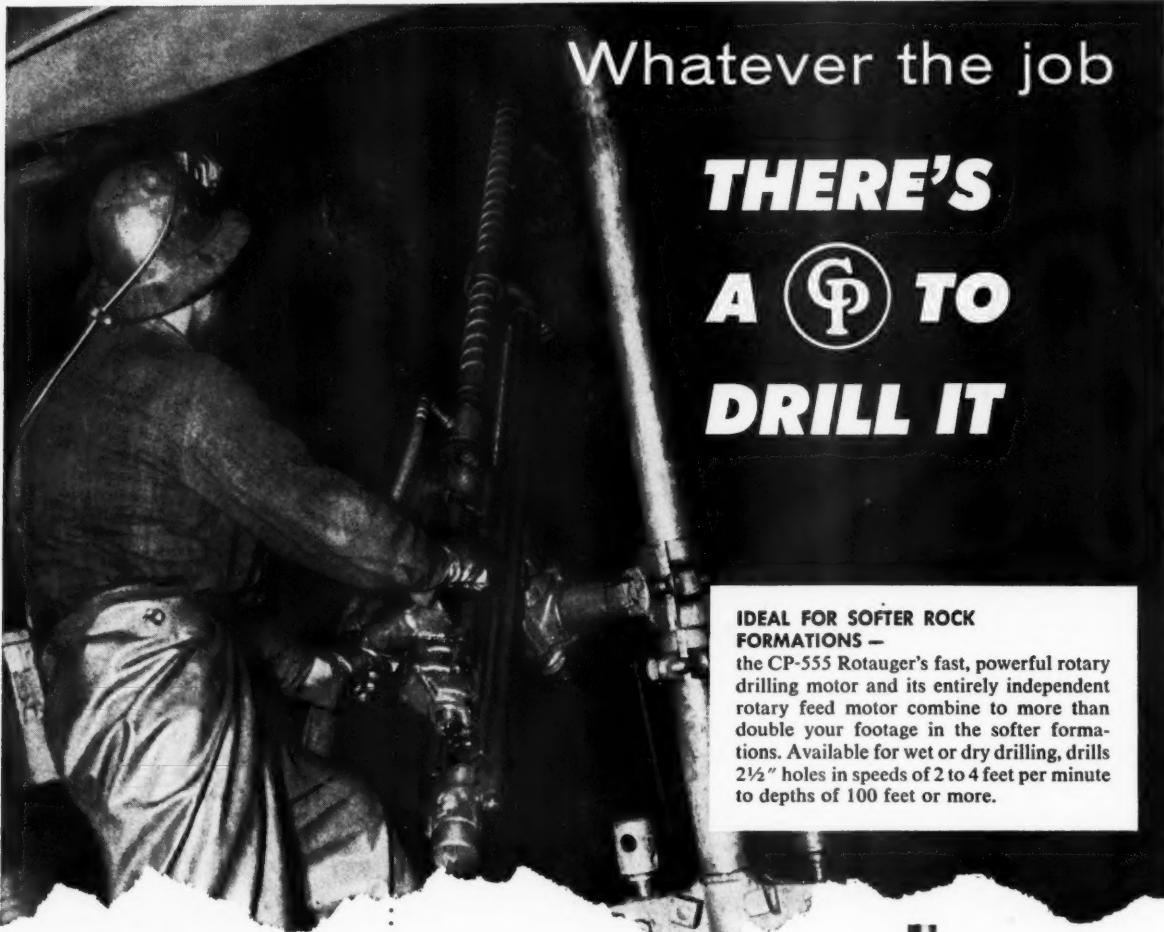
Honorary memberships in AIME were awarded with appropriate citations to two of the country's and the industry's outstanding leaders. Secretary of the Treasury George M. Humphrey, formerly president and chairman of the board of M. A. Hanna Co., had, prior to his designation to the Eisenhower Cabinet, been very active in iron ore mining, steel production, coal mining, and the development of the Quebec-Labrador iron mining enterprises. The other honorary AIME membership recipient was Louis Shattuck Cates, chairman of the board of Phelps Dodge Corp. His citation read "For his outstanding development and administration of the low grade copper enterprises in Utah and the Utah Copper Co., and in Arizona, at the Ray Consolidated Copper Co., and the Phelps Dodge Corp. His eminence as a leader in these fields deeply warrants this recognition by the institute he has served so well as president and, for many years, director."

The James Douglas medal, for distinguished achievement in nonferrous metallurgy, was awarded to Charles R. Kuzell, vice-president and general manager in charge of Western activities for Phelps Dodge Corp. Louis Buchman, retired vice-president and director of Kennecott Copper Corp., was awarded the William Lawrence Saunders gold medal in recognition of his achievements in mining.

The Anthony F. Lucas medal was awarded to Stewart Edward Buckley for achievements in the petroleum industry, and the Robert H. Richards award was presented to Arthur W. Fahrenwald for his work in minerals beneficiation. For accomplishments in leadership, Stephen M. Jenks was awarded the Benjamin F. Fairless award and M. O. Holowaty and John J. Gilman were awarded, respectively, the J. E. Johnson, Jr. award and the Rossiter W. Raymond memorial award for accomplishments in their particular fields. Dean Elmer Allan Holbrook was the recipient of the Mineral Industry Education award, given this year for the first time, and the Daniel C. Jackling award was presented posthumously to Rev. James B. Macelwane, who died on February 15—just a few days before he was to have delivered the Jackling lecture. The Institute's gavel was turned over to new president, Carl E. Reistle, Jr., vice-president of Humble Oil & Refining Co., and he was replaced as president-elect by Grover Holt, manager of mines, Cleveland-Cliffs Iron Co.

A great many convention goers were accompanied by their wives, for whom a complete program was arranged. The docket included a luncheon and fashion show on the Starlight roof of the Waldorf-Astoria Hotel, other luncheons, receptions and the Women's Auxiliary annual meeting.

Over all the convention was a great success in bringing professional men together for a lot of serious business and enjoyment.



Whatever the job

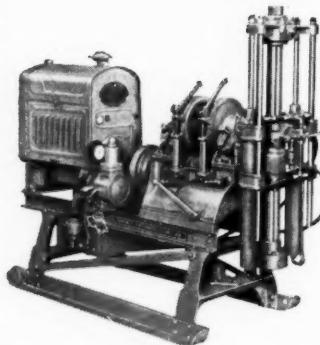
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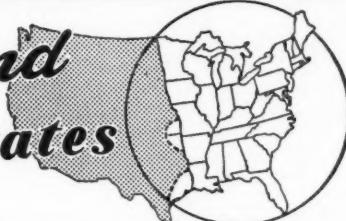
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NEWS and VIEWS



Eastern and Central states



Kentucky Coal Firm Formed

Nashville Coal, Inc., a new \$11,000,000 combination coal-mining and river-transport firm has been incorporated to do business in Paducah, Ky. It is a subsidiary of the West Kentucky Coal Co. of Madisonville.

Cyrus Eaton, Cleveland financier, is chairman of the board of both companies. Hooper Love, Nashville, Tenn., is president and Mark Eastin, Madisonville, is executive vice-president.

Nashville Coal represents property of the Justin Potter Mining Co. of Nashville, purchased by West Kentucky last year.

Power Plant Contract Let

Kaiser Engineers Division of Henry J. Kaiser Co. has been awarded a contract by the St. Joseph Lead Co. to build its projected \$16,000,000 power plant at Josephtown, Pa. The plant will include two 50,000-kw turbo-generators and will be designed to facilitate future expansion. It is scheduled to begin operations within two years.

Ancient Mine Pits Found

Evidence has been found that indicates there were mining pits on Isle Royale in Lake Superior as early as 2000 B. C., according to Dr. R. W. Drier, professor of metallurgical engineering at Michigan Tech.

Drier said charred wood unearthed during an archaeological expedition to the island has been dated by the radio-

active carbon 14 method in a University of Michigan laboratory. The ancient miners heated copper-bearing rocks with fire, then poured water on the rocks to split them.

Human Engineering Institute

Dunlap and Associates, Inc., announces its fourth annual Human Engineering Institute to be held in Stamford, Conn., June 18-22. It offers an advanced course built around new concepts in the design of equipment, consumer products, and workplaces, emphasizing the "systems approach" to design planning, allocation of functions between men and equipment, and man-machine relationships. Deadline for enrollment is May 21.

New Processing Plant

Zonolite Co., a vermiculite mining firm operating in the Laurens-Enoree area of South Carolina since 1946, has completed a new vermiculite processing plant near Lanford, S. C.

Construction was started a year ago. The plant, which began full scale operations in March, processes raw ore mined in the Laurens-Enoree area, removing clay, sand, rock and other waste products to produce vermiculite concentrate for shipment to manufacturing plants.

Vermiculite is used chiefly for light-weight plaster and concrete aggregates, housefill insulation, fertilizer and soil conditioners.

Mine Being Developed

The Grace Mine of Bethlehem-Cornwall Corp., a division of Bethlehem Steel Co., is making progress in its development at Morgantown, Pa., but actual production will probably not get started for about four years.

Construction of the iron mine began in 1951. Two shafts that will be nearly 3000 ft deep are still under construction but a number of buildings have been completed. Construction of special tunnels reinforced with concrete may require more than two years.

Production is expected to reach 9000 tons of ore daily. The iron ore runs about 42 percent iron and will be concentrated to about 62 percent grade. The product will be finally pelletized and shipping in about 100 car lots daily.

Mining operation will use undercutting methods in which the tunnels extend under the ore pockets. About 1200 workers are expected to be eventually employed.

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Establishes Scholarships

Pocahontas Fuel Co., Pocahontas, Va., has established two engineering scholarships each at West Virginia University, Virginia Polytechnic Institute and Lehigh University, with one scholarship in each school beginning in September 1956 and the other September 1958.

The undergraduate scholarships will cover tuition, other university costs and part of the living expenses of the recipients. School officials will award and administer the scholarships.

The company, greatly concerned about the shortage of trained engineers available to coal mining companies, established the scholarships in the hope of attracting high school graduates to the engineering field.

Osceola Copper

Help in the current copper shortage is now coming from the Osceola lode of the Calumet Division, Calumet & Hecla, Inc., Calumet, Mich. The mine's return to production marks an important step in the largest underground unwatering project in mining history.

Over 7 billion gallons of water will have been pumped from the Osceola lode when full production is reached next fall. This will make available

an estimated 200 million lb of copper ore which was abandoned and flooded during the low price period of the 1930's.

The No. 13 shaft is now unwatered and going into full production after a 16-week's delay caused by a strike last summer. Unprecedented engineering experience gained on the Osceola unwatering project will prove invaluable in any future attempts to recover copper ore from water-filled mines.

Texas Cement Expansion

Two cement companies of Houston, Tex., are in the process of expanding production facilities at an approximate cost of \$17,000,000.

The Ideal Cement Co. is building a new plant adjacent to its present facilities. The project, including installation of new docks, a clay wash mill, two shell hoppers, a shell storage area, a new kiln, eight clinker storage bins, raw mills and finish mills, will cost approximately \$10,500,000.

The Lone Star Cement Corp. is expanding its facilities at an approximate cost of \$6,600,000. This project includes one new kiln and related facilities.

Together the two projects will increase daily production in the Houston area by about 6000 bbls.

Wanted

ENGINEER-GRADUATE

Excellent opportunity for qualified individual to handle sale of mining equipment. Desire man experienced dealing with top management. Age 30-40 years. Travel required. Established company. Replies confidential. Address Box 818, in care of this publication.

Ilmenite Expansion Scheduled

National Lead Co. will complete this year a 25 percent expansion in the capacity of its ilmenite mine and mill at Tahawus, N. Y., the largest operation of its kind in the world.

National Lead took over the properties in 1941 in order to insure a domestic source of titanium ore for products essential to the war effort. Production there began in 1942.

The mill concentrates ore for shipment to National Lead's titanium pigment plants at Sayreville, N. J., and St. Louis, Mo.

Goals Haul Coal

Mechanization of coal mines has spread far but it hasn't reached two brothers working a leased mine near Barrourville, Ky. Roland and Boots Tye use two goats to haul half-ton coal cars from the mine.

The brothers say their two goats are much better than mules or ponies. For one thing the goats are scavengers and don't require much money to feed. Furthermore, the 28-in. seam of coal is too low for a mule or pony.

Two Produce Rare Earths

The Crane Co. and Vitro Corp. of America have set up a joint operation to produce thorium, rare earths and heavy minerals from monazite sands and other ores. Frank F. Elliott, president of Crane, and J. Carlton Ward, Jr., Vitro president, have announced.

Under the agreement Crane and Vitro will each own 40 percent of Heavy Minerals Co., its mining subsidiary Marine Minerals, Inc., and associated operations. A processing plant will be built near Chattanooga, Tenn. By the end of this year, the companies said, their combined investment will be about \$6,000,000. A minority interest of 20 percent is held by a French company which holds processing patents for thorium, rare earths and heavy minerals.

Marine Minerals is located near Aiken, S. C., and is now mining rutile for sale as a raw material for titanium, ilmenite for titanium pigments, and zircon monazite for processing by Heavy Minerals. Another mining operation is being developed along the Gulf Coast of Florida between Panama City and Pensacola.



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Coal Mine to Reopen

Pennsylvania Coal & Coke Division of the Penn-Texas Corp. will resume operations of its Mine 8 near Johnstown, Pa., in April. The mine has been closed since June 1954. Between 70 and 100 men are expected to be employed.

Lead & Zinc Groups Meet

A joint meeting of the Lead Industries Association and the American Zinc Institute will be held at the Statler Hotel in St. Louis, Mo., April 23, 24 and 25. The first day will be confined to activities of the American Zinc Institute. On the second day a joint AZI-LIA session will be conducted at which the Honorable Felix E. Wormser, assistant secretary of the Interior, will make some Washington observations. The domestic and world outlook for lead and zinc and the place of technical activities in market development, will be discussed.

Tuesday afternoon and Wednesday morning will be confined to activities of the Lead Industries Association.

Anthracite Mine Closed

Glen Alden Corp. has closed an anthracite mine at South Wilkes-Barre, Pa., because it is a "high-cost" operation. The mine, normally employing about 325 men, last year produced 169,000 tons of anthracite, about four percent of Glen Alden's total output of more than 4,000,000 tons.

Faraday Shaft

Dravo of Canada Limited, Toronto, has started shaft sinking operations on a new production-size shaft for Faraday Uranium Mines Limited near Bancroft, Ontario. The shaft, Faraday's No. 1, will have three compartments and will be sunk to a depth of 1050 ft below the adit level.

The contract also calls for six standard shaft stations, two pumping stations and a loading and spill pocket.

TVA Annual Coal Report

The Tennessee Valley Authority received 14,377,000 tons of bituminous coal at its steam power plants in 1955, spending more than \$60,000,000 for the coal and its transportation at an average cost of \$4.20 a ton.

Western Kentucky coal fields supplied 6,000,000 tons, or 42 percent of the total. Tennessee mines supplied 4,500,000 tons, and Illinois mines furnished 2,500,000 tons. The remaining nine percent was purchased in eastern Kentucky, Virginia, Alabama and Indiana.

TVA's Shawnee steam-electric plant near Paducah, Ky., burned 4,206,000

tons of coal last year, believed to be the greatest amount of coal ever consumed in one year by a single steam-electric plant.

During December and January of this year, TVA was receiving coal at the rate of 1,500,000 tons a month, which is the rate TVA expects to average in 1956. A year ago, coal was being received at the rate of 1,000,000 tons a month.

The coal TVA's steam plants consumed last year was more than 11 percent of the total burned by all electric utilities in the country.

Fifth National Clay Conference

The Fifth National Clay Conference will be held at the University of Illinois, Urbana, Ill., October 8, 9 and 10, 1956.

Contributed papers on subjects related to clay mineralogy or technology will be welcome. Titles for inclusion in the program must be received by May 1, and short informative abstracts will be required by June 15. Titles and abstracts may be sent to Dr. W. F. Bradley, Illinois Geological Survey, Urbana, Ill.



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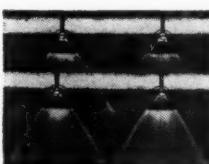
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Reynolds Expansion

Reynolds Metals Co. is undertaking an expansion of its facilities in Texas and Alabama which may cost up to \$43,000,000.

The expenditure will increase production of the firm's Laquinta alumina plant near Corpus Christi, Tex., by more than 50 percent and enlarge facilities of the aluminum sheet rolling mill at Sheffield, Ala.

Executive Vice-President J. Louis Reynolds said it is necessary to increase the firm's alumina production to supply requirements of the new 200,000,000-lb aluminum reduction plant to be constructed adjacent to Reynolds' present northern Alabama operations. The increased production of primary metal, in turn, requires greater sheet-rolling capacity at the mill near the reduction plant.

An estimated outlay of between \$25,000,000 and \$30,000,000 will be required at the Laquinta plant. It is planned to increase production there from 1000 to more than 1500 tons daily.

In addition, Reynolds will extend its nearby pier at which bauxite-carrying vessels unload ore. The bauxite storage facility will be expanded and the channel by which ships approach

the pier will be dredged so as to deepen and widen the shipping lane.

Reynolds said plans call for expenditure of nearly \$13,000,000 in expanding the Alabama facilities, an integrated part of the firm's operations in that state.

Cement Progress

Consolidated Cement Corp. reports that the expansion program at its Fredonia, Kans., plant has been completed with the installation of new grinding and auxiliary facilities. A new 425-ft kiln was placed in operation in November 1955, after which the older kiln was temporarily shut down during the next three months for rehabilitation. The program has increased annual capacity of the Fredonia plant by approximately 1,300,000 bbl of cement.

At the same time the company reported that progress has been satisfactory in the construction of a new plant at Paulding, Ohio. Plant construction at Paulding began in August 1955 and the company has hopes that it can be placed in production in July or August of this year. Annual capacity of this plant will be 1,250,000 bbl of cement.

Strip Mine Opened

Hanna Coal Co. has announced that it will open another field of strip mining operations about five miles west of Cadiz, Ohio. The new field is estimated to have reserves of several millions tons of coal.

Roof-Fall Deaths Rise

The U. S. Bureau of Mines has reported that the number of deaths from roof falls jumped from 17 in January 1955 to 35 in January 1956. Of the total, 29 were in bituminous mines, compared with 13 a year ago, and six were in anthracite operations, compared with four in January 1955.

The Bureau also reported that the fatality toll from all accidents in coal mines registered a heavy increase. In January 1955 total deaths were 39. Number of deaths for January of this year reached 56, an increase from 34 to 44 in bituminous mines and from five to 12 in anthracite mines. The frequency rate per million man-hours of exposure jumped from 1.16 to 1.45, the highest since April 1952.

Thomas H. Miller, acting director of the Bureau, said, "The fact that 63 percent of all fatalities were the result of falls of roof and coal points to a dangerous relaxation in safety practices. We urge that mine operators insist that places be adequately timbered or roof-bolted and that mine workers assure themselves that they are carrying out timbering standards and not taking undue risks."

WANTED

STAFF ENGINEERS under 50 years of age for challenging project work in mines, mills, smelters, and refineries for major copper and non-ferrous producer. Want self-reliant and able engineers with mining or metallurgical backgrounds for engineering, design, procurement, and construction work, as well as younger inexperienced men. Must be willing to travel world-wide as required from central engineering department in Salt Lake City, Utah. SALARY OPEN. Reply with full details to Box No. 113 this magazine.

Steam Electric Plant Set

Southwestern Virginia property of Clinchfield Coal Corp. will be the site of a major steam-electric generating plant to be erected by the Appalachian Electric Power Co., a subsidiary of American Gas & Electric Co. Clinchfield is setting aside 40,000,000 tons of coal from its large reserves for supplying coal to the plant over a 30-year period under its contract with Appalachian.

The new power station will be known as the Clinch River Plant. To cost an estimated \$55,000,000, it will have an initial generating capacity of 450,000 kw and is expected to consume over 1,300,000 tons of coal per year.

Excavation work started early in April. Both units are scheduled for completion in 1958.

Philip Sporn, president of Appalachian and its parent company, said the new plant was located in southwest Virginia for three reasons: The Clinch River station will supply territorial need for additional power, it will be situated in the middle of a rich field of economical coal, and it will be able to utilize existing transmission lines to feed the bulk of its power to major load centers to the North.

Sporn emphasized the fact that coal would power the plant's two giant generating units, pointing out that this fact would have considerable economic significance not only to the immediate Clinch valley mining area but to the entire bituminous coal industry.

The Clinch River plant will employ cooling towers for steam condensing water and two 10-story steam boilers.

Wanted

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Capacity 4.4 tons, 42" track gauge, end dump.

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Join in Ore Project

Jones & Laughlin Steel Corp. and Wheeling Steel Corp. have joined Cleveland-Cliffs Iron Co., Inland Steel Co., and International Harvester Co. in a northern Michigan iron ore project. Some 2,000,000 tons of low grade ore will be upgraded annually in the joint operation on the Marquette Range.

Jones & Laughlin has also entered into an agreement with Quebec Cobalt & Exploration, Ltd., for exploratory work on a deposit of 32 percent iron ore in the Mt. Wright area of New Quebec at a two-year cost of \$250,000.

Fellowship Program

The Division of Mineral Engineering, College of Mineral Industries, Pennsylvania State University, is inviting interested companies and organizations to participate in their fellowship program.

Mineral extractive industries are not getting their share of technically trained youth of the country. In the effort to alleviate this condition, the Division of Mineral Engineering considers a fellowship program by the mineral extractive industries essential. Contributors will have the opportunity to know the fellows on

projects, who may be potential recruits, and will receive pre-publication information on research results.

If you wish to participate, write to the chairman of the Division of Mineral Engineering at University Park, Pa.

To Expedite Coal Shipments

Hazard & Southern Railroad Co., Hazard, Ky., will build connecting lines to two other railroads to facilitate shipment of bituminous coal from the Hazard field to Southern and Eastern export markets. Plans call for building more than six miles of new line to connect with the Louisville & Nashville and the Chesapeake & Ohio Railroads at Dean, Letcher County.

Coal from the Hazard field has been shipped north in the past because of lack of adjacent rail outlets to the South or East.

Kiln Contract Let

Universal Atlas Cement Co., a subsidiary of U. S. Steel Corp., has awarded a contract to Rust Engineering Co. of Pittsburgh for construction of a fourth rotary kiln and supporting facilities at its Hudson, N. Y., mill. Work is now under way.

Coal Mine to Be Opened

Clinchfield Coal Corp. has begun construction work on a new mine to be opened at Clinchfield, Russell County, Va., at a total estimated cost of \$4,000,000. The new mine, to be named Moss No. 2, will have a productive capacity of 1,000,000 tons of coal per year and is expected to reach full production during the latter part of this year. Anticipated employment at the mine will reach 375 men. The coal produced will be of metallurgical grade.

Coal Barge Loading Facilities

New docking facilities to load barges with about 1000 tph are being constructed along the Ohio River above Caseyville, Ky., for the DeKoven Coal Mining Co., Sturgis, Ky. The facilities, being constructed by Dravo Corp., Pittsburgh, Pa., include a river dock to extend some 1275 ft along the shoreline that is designed to handle seven loaded and seven empty coal barges. A 42 in. wide conveyor belt will transfer coal one mile from DeKoven's mine to the barge loader.

The company plans to commence operations of the loading dock next summer.

Algoma Uranium

(Continued from page 83)

December 31, 1961. The bulk of this issue was bought by Rio Tinto and associates. Each \$1000 debenture carries 40 warrants to purchase capital stock of Algoma at \$11 per share to be exercised by March 2, 1959.

3. Rio Tinto also arranged with the Bank of Montreal to borrow \$15,000,000 at 4½ percent secured by \$15,000,000 4½ percent First Mortgage Bonds maturing January 1, 1960. This money will only be drawn as needed.

4. In consideration of the above, Rio Tinto has the right to purchase 500,000 shares of capital stock at \$11 per share on or before March 2, 1959.

Acknowledgments

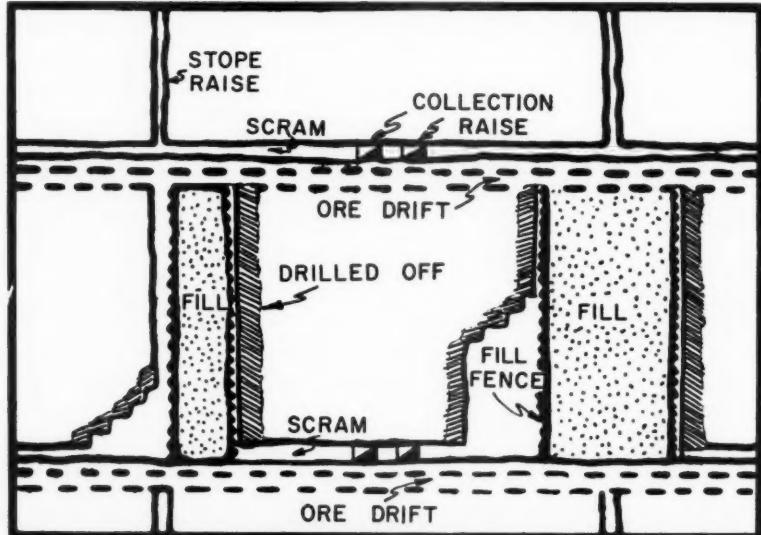
The Algoma development is a team effort and I would like to acknowledge the help of those contributing to it.

In Toronto, in addition to our competent staff, W. A. Hutchison, our consulting engineer, and R. P. Ehrlich, our metallurgist, give great assistance. R. M. Way & Co. has designed the plants. All the officers and directors take an active interest in the company. F. R. Joubin, president, contributes regularly and particularly in dealing with various departments of government. It is of exceptional advantage to be able to call on the Rio Tinto organization both in Canada and Britain. On the business side, W. B.

Malone of Rio Tinto (Canada) devotes much effort to the project as well as J. N. V. Duncan, R. W. Wright and Oscar Weiss from overseas. More on the technical side, Dr. D. R. Derry in Canada and E. G. Lawford, L. C. Hill and Charles Julian from Britain all give time and constructive ideas freely. Probably more than all, however, I should like to thank the young and aggressive staff and our manager, R.

C. Hart, for their help and cooperation.

We have had splendid cooperation and help from the Federal Mines Branch on our metallurgy and also from various Provincial Government departments on other problems. Agencies of both the American and Canadian governments are most cooperative in obtaining materials in short supply.



Sketch of the Quirke stoping method

Taconite Plant Ready

Reserve Mining Company's E. W. Davis plant on the north shore of Lake Superior at Silver Bay, a major item of the company's \$190,000,000 Minnesota taconite project, has been completed and is being tuned up to full-scale production. The plant's designed capacity is 3,750,000 tons of taconite pellets a year.

Reserve Mining Co., which is jointly owned by Republic Steel Corp. and Armco Steel Corp., is also completing adjacent harbor facilities and has stockpiled 580,000 tons of pellets. Transportation of the taconite pellets produced at the Davis plant will require one to one and a half ore ships daily during the Lake season.

Davis plant is joined by a 47-mile company railroad to a primary ore-crushing plant at Babbitt, Minn.

Rail-to-Barge Plant

(Continued from page 89)

plug type connectors at the end of all conveyors. Control houses are located at the shaker structure and on the spar barge. The feeder and conveyors can be stopped or started from either location. Capacity of the conveyor system is 450 tph.

The control house on the barge also houses a three drum hoist for handling river barges and for moving the spar barge laterally. Four reinforced concrete "dead-men" buried in the hillside provide anchorage for the main spar barge cables and spring lines. A single drum hoist is used to move the loaded railroad cars to the hopper.

To assist in holding the hillside against slippage, approximately 65 holes, 33 ft deep, were drilled into solid rock in staggered rows, and filled with reinforced concrete. This work was done by Parsons Drilling Co., Piketon, Ohio.

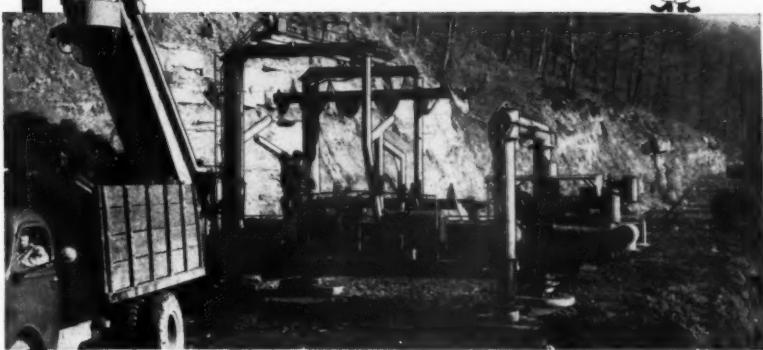
Credits

Foundation and dredging work was performed by the Byrnes-Conway Construction Co., St. Bernard, Ohio; the electrical work by Meier Electric Co., Cincinnati, Ohio; steel details and fabrication by West Virginia Steel Corp., Charleston, W. Va., and the steel erection by Steel Erectors, Inc., Charleston, W. Va. Link-Belt Co. furnished the conveyor drives, idlers and pulleys. Credit is due to all of these firms for faithful performance of their work and for helpful suggestions from their supervisors and engineers, especially to D. F. Parker, chief engineer, West Virginia Steel Corp., and to I. W. Newman, division superintendent, L & N Railroad, Latonia, Ky. Gene Hilton, division engineer, Jewell Ridge Coal Corp., supervised the construction.

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GENERAL SPECIFICATIONS — MODEL 28

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Required pit width: 30 ft. min.

Power: 175 hp Diesel engine

Hydraulic Frame Jack Lift: 54 inch

Auger Diameter: 44" to 28"

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Western States

Minerals Conference

The Third Annual Rocky Mountain Minerals Conference is scheduled for September 26 to 28, 1956, in Salt Lake City with technical papers representing all branches of AIME membership. The Salt Lake meeting will precede that of the American Mining Congress Convention at Los Angeles, making it possible for members to plan attendance at both events. General conference chairman will be R. C. Cole, assisted by A. J. Thuli, Jr.

Nevada Gypsum

Johns-Manville Corp. has signed an option on a large gypsum deposit in southern Nevada and is considering entering the gypsum business, according to a company official.

The deposit, located between Las Vegas and Henderson, is known as the Lucky Gypsum property. J-M Exploration Department will soon begin diamond drilling, trenching and other exploratory work to determine the commercial possibilities of the property.

Conjecture Expansion

Production of lead-silver-zinc ore at the Conjecture Mine near Lakeview, Idaho, will be increased from the present 75 tons daily to 150 tons by June 1, according to Don Majer, president. The present 1½-compartment shaft will be enlarged to 2½ compartments and the shaft will be deepened an additional 200 ft to open a new 700-ft level, he reported.

Alaska Iron

Snettisham Peninsula, 30 miles southeast of Juneau, Alaska, contains a substantial reserve of titanium-bearing iron ore from which a concentrate meeting steel mill specifications can be produced by simple methods, the United States Department of the Interior has announced.

The statement is based on a study by the Bureau of Mines which included magnetometer observations, diamond ore drilling, and metallurgical testing. The work is part of a continuing effort to determine Alaska's potential iron and titanium ore

reserves, motivated by the growth of the iron and steel industries in the Pacific Northwest.

The Alaskan deposit is easily accessible, a Bureau technical report says, and is so situated that year-around shipments through the Inside Passage would be feasible.

Before development could be undertaken, however, it would be necessary to provide a dock, housing, and other facilities, since the area is virtually uninhabited.

A copy of R. I. 5195, "Studies of the Snettisham Magnetite Deposit, Southeastern Alaska," by R. L. Thorne and R. R. Wells, can be obtained from the Bureau of Mines, Publications-Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa. It should be identified by number and title.

Four Corners Exploration

A \$250,000 contract for uranium exploration has been awarded to Southern Geophysical Co., according to Dr. Sidon Harris, president. The contract was awarded by New-Shat-Tex Corp. and Exploration Co., owned jointly by New Jersey Zinc Co. and the Texas Co., and calls for drilling 174,000 ft of core holes.

Coring operations began March 1 on properties held by the New-Shat-Tex in the Four Corners area of Utah, Colorado, New Mexico and Arizona, approximately 150 miles northeast of Flagstaff, Ariz.

Canadian Copper

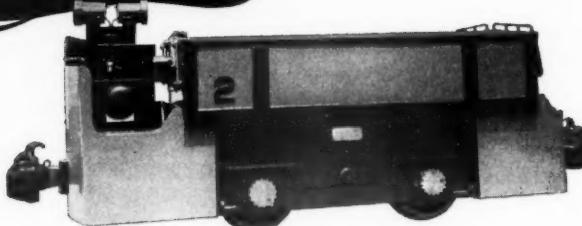
The old Eureka copper mine, southwest of Nelson, B. C., is expected to be put into production this spring after a 37-year shutdown, according to Dr. Frank Buckland, president of Copper Leaf Mines, Ltd.

Copper Leaf has purchased the former Kenville Gold Mines' mill and is planning to concentrate 200 tons of Eureka ore daily. Concentrates will be shipped to the Tacoma smelter of the American Smelting & Refining Co. Between 50 and 60 men will be employed at the mine and mill, according to present plans.

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1956 Mining Show

Program Committee for Los Angeles Meeting Appointed

DISTINGUISHED mining men representing all sections of the country and all branches of the metal and industrial mineral industries have joined the team and are ready for the kick-off which starts the big job of setting up the program for the AMC Convention and Exposition in Los Angeles October 1-4. The Program Committee will consider the matters that should be brought before general and technical sessions of this industry-wide gathering and select the best-qualified authorities in mining and pertinent Government agencies to take part.

The Committee has a big assignment in choosing convention subjects, and will welcome suggestions from JOURNAL readers. Your ideas and recommendations should be addressed to the Program Committee, American Mining Congress, 1102 Ring Building, Washington 6, D. C. The Exposition, with over 90 percent of the available space at the Shrine Exposition Hall already under contract, will be the greatest showing of mining machinery and equipment ever assembled in the West. Exhibits will be aimed at catching the eyes of all men who have an interest in the mineral industries. The expertly planned and prepared displays will be of definite value to administrators, including business executives and Government leaders; to managers, superintendents, foremen, and maintenance men; and technicians, engineers, and planners—in fact to all those interested in doing a better job in mining and mineral treatment. Where can a man gain more familiarity with the newest equipment and supplies, or where can he expose himself to a more idea-begetting environment than at the Mining Show in Los Angeles next October? More and more companies are finding that it pays dividends to send their key men to the AMC Conventions. Through the general and technical programs, the exhibits, the informal discussions with other mining men and the contacts that the convention provides, the investment of sending them returns many-fold.

As older convention-goers confidently expect, a gala entertainment

program is also "in the works." The Miners Jamboree on Tuesday night, October 2, will bring the convention crowd together at the famous Hollywood Palladium for dinner, dancing, and the finest of entertainment. Climaxing the four-day meeting will be the annual Banquet Thursday evening, in the renowned Cocoanut Grove and Embassy Room of the Ambassador Hotel.

For the hundreds of ladies who plan to accompany the men to Los Angeles, two daytime events are in store. A Welcoming Luncheon is scheduled for Monday, October 1, in

the Biltmore Bowl. Planned for Wednesday, October 3, is a luncheon and style show at the glamorous Beverly-Hilton Hotel, featuring a showing of up-to-the-minute fashions by Southern California couturieres.

On Friday, October 5, mining men and ladies will have an opportunity to visit nearby points of interest, including the Crestmore operations of Riverside Cement Co., the internationally famous Riverside Inn, the Kaiser Steel plant at Fontana, and the Irwindale plant of Consolidated Rock Products Co., also the diatomaceous earth operations of Great Lakes Carbon Co. at Palos Verdes, Los Angeles Harbor, and a large oil refinery. More details on these conducted tours will appear in a subsequent issue. A trip to Walt Disney's Disneyland is also planned for Friday.

Wise mining men are making their plans now to take in this outstanding Convention and Exposition. The hotel situation in Los Angeles is good, but the earlier your reservation is in, the greater your chance of being accommodated in accordance with your preference. Requests should be addressed to the AMC Housing Bureau, Los Angeles Chamber of Commerce, 1151 South Broadway, Los Angeles 15, Calif.

PROGRAM COMMITTEE CHAIRMEN

National Chairman

WALTER C. LAWSON, Gen. Mgr., Phelps Dodge Corp., Douglas, Ariz.

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California: L. T. KETT, Pres., Mountain Copper Co. of Calif.

Colorado: R. R. WILLIAMS, Mgr. of Mines, Colorado Fuel & Iron Corp.

Idaho: JOHN D. BRADLEY, Pres., The Bunker Hill Co.

Montana: JOSEPH T. ROY, Mgr. of Smelter, American Smelting & Refining Co.

Nevada: NORMAN E. HANSON, Asst. to the Pres., Western Div., Basic Refractories, Inc.

New Mexico: JOHN B. KNAEBEL, Mgr., New Mexico Operations, The Anaconda Co.

Oregon: E. S. MOLLARD, Gen. Mgr., Hanna Nickel Smelting Co.

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Washington: DRURY A. PIFER, Dir., School of Mineral Engineering, University of Washington

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AMC DRILL COMMITTEE

THE American Mining Congress has set up a Committee on Underground Drilling to work in the interest of progress for the benefit of the underground mining industry. Subjects to which the committee will give attention include drill machines, bits and drill steel.

Appointments on the committee have been accepted by Floyd R. Anderson, Gardner-Denver Co.; Lester F. Bishop, The Anaconda Co.; Max Gelwix, Climax Molybdenum Co.; T. E. Giggey, Ingersoll-Rand Co.; Ray J. Martotte, Calumet & Hecla, Inc.; Robert W. Persons, Crucible Steel Co. of America, as chairman; William F. Towne, Bethlehem Steel Co.; and the editor of Mining Congress Journal, as secretary. Membership is on a revolving basis and it is intended to include representatives of other areas and companies in the future.

Wyoming Uranium Plant

Lost Creek Oil & Uranium Co. of Rawlins, Wyo., will build a uranium ore processing plant near Riverton, according to Robert W. Adams, president. It is expected that the plant will be constructed within a year, following completion of negotiations with the Atomic Energy Commission. According to Adams, Lost Creek has obtained contractual agreements with other uranium ore producers in Fremont County for delivery of ore to the plant when it is completed.

Metals & Minerals Conference

The annual AIME Pacific Northwest Regional Metals and Minerals Conference will be held this year in Seattle at the Olympic Hotel, on May 3, 4 and 5.

Conference general chairman, E. R. Marble, recently retired manager of the Tacoma Smelter of the American Smelting and Refining Co., has had the help of J. G. Johnston, chief metallurgist, Bethlehem Pacific Coast Steel Corp. of Seattle, in arranging the Metals Branch program. W. C. Douglass, vice-president, Kelowna Mines-Hedley Ltd. of Seattle, has assisted in arranging the program of the Mining Branch.

Kennecott Personnel Shifts

Several changes in the operating organization of Kennecott Copper Corp. have been announced by Frank R. Milliken, vice-president.

J. P. Caulfield, who since early 1953 has been general manager of the corporation's Western Mining Divisions, will become assistant to Milliken in Kennecott's executive offices in New York City. C. D. Michaelson, vice-president and chief executive of the Braden Copper Co. in Chile, a subsidiary of Kennecott, will become general manager, Western Mining Divisions. With headquarters in Salt Lake City, Utah, Michaelson will supervise the corporation's properties in Utah, Nevada, Arizona and New Mexico. R. M. Haldeman, general manager, Braden Copper Co., will become the chief executive for Braden in Chile.

Caulfield became associated with the Kennecott organization in 1951 as general manager of the corporation's Utah Copper Division, a position he held until his advancement to general manager of the Western Mining Divisions.

Michaelson joined Braden Copper Co. as general superintendent in 1948. He served in this capacity until 1952 when he was named general manager. In 1954 he was appointed vice-presi-

dent and elected a director of Braden Copper Co.

Haldeman was employed by the Braden mine staff as shift boss and level foreman in 1941. Progressing steadily through important positions in the Braden organization, he was named general manager in 1954.

Asarco Progress

In its annual report to stockholders, the American Smelting & Refining Co. said that during 1955 a start was made on the installation of additional facilities at the Silver Bell mine, northwest of Tucson, Ariz., to recover the small molybdenum content of the copper concentrates. The company expects these facilities should be in operation in the second quarter of 1956.

The company also reported that from June 1955, when the dredge for the draining of the Black Lake and removal of the overlying silt from the asbestos ore deposit underlying the lake was completed, and the end of the year approximately 6,000,000 cu yd of silt were removed. Construction of the mill will start this spring. Present plans call for the drainage and dredging operations and preliminary mine stripping to be completed so that initial processing of asbestos

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ore through the mill may commence sometime in 1958. Full-scale operations should make available 100,000 tons of asbestos fibre a year.

New Mexico Uranium Merger

A tentative agreement for merger between Sabre Uranium Corp. and Pinion Uranium Co. has been reached, according to an announcement made by Richard Bokum, an official of both companies. The merger will also involve a transaction with American Metal Co., Ltd., subject to certain conditions, for the development and mining of the Sabre-Pinion ore body in the Grants area in New Mexico. The participants in the new company have had preliminary discussions with the Atomic Energy Commission concerning the construction and operation of a mill.

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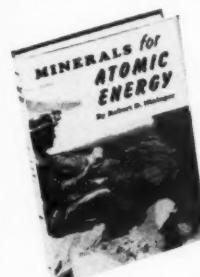
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Kennecott Installs Punch Cards

Kennecott Copper's Utah Copper Division is presently in the process of establishing a new central punch card tabulating system to handle payrolls and to produce other analyses needed by management.

J. P. O'Keefe, division comptroller, says the new system will better serve the needs of management for current statistics and analyses which have not been available under present methods. He said it was one of a number of steps being taken to modernize the general accounting system of the company and thus render better service to management.

Now The Bunker Hill Co.

The board of directors and stockholders of Bunker Hill & Sullivan Mining & Concentrating Co. have approved a change in corporate name to "The Bunker Hill Co."

The action was taken because the present name no longer reflects the full scope of the company's operations, President John D. Bradley said. A large share of company income is now derived from the processing of custom ores and concentrates from Canada, Australia and South America, as well as from other American mines,

and "consequently, Bunker Hill is now far advanced beyond what is implied by the restrictive words 'mining and concentrating,'" Bradley said. He added the name change reflects company's growth and long-range expansion program to modernize its structure operations. As part of its expansion plans, the company intends eventually to consolidate and operate the facilities of its Northwest Lead Co. subsidiary as a sales fabrication division of Bunker Hill.

Nevada Mining Association

At its annual meeting on January 9, the Nevada Mining Association elected the following officers and directors: Norman E. Hanson, president; F. A. McGonigle, first vice-president; Roy A. Hardy, second vice-president; Louis D. Gordon, executive secretary, and directors, L. N. Grindell, U. S. Lime Products Corp.; Roy A. Hardy, consulting engineer; Norman E. Hanson, Basic Refractories, Inc.; John C. Kinnear, Jr., Kennecott Copper Corp.; F. A. McGonigle, Manganese, Inc.; A. E. Miller, The Anaconda Co.; Charles H. Segerstrom, Nevada-Mass. Co.; J. J. Strutz, Jr., Wah Chang Mining Corp., and S. H. Williston, Cordero Mining Co.

Chile Copper Expansion

A proposal of Andes Copper Mining Co., subsidiary of the Anaconda Co., to spend an estimated \$52,950,000 to bring into production part of its newly discovered copper ore bodies near Indio Muerto mountain, has been approved by the government of Chile. It is expected it will take about four years to get the new El Salvador mine, located about 20 miles from the company's Potrerillos mine, ready for production of an annual output of 100,000 tons of refined copper.

In the formal request to Chile's president for permission to develop Indio Muerto, Roy H. Glover, Anaconda board chairman, described the ore bodies as "the greatest and most important development in copper mining in Chile since the initiation of the Chuquicamata development in 1914," a mine generally considered among the world's great copper discoveries.

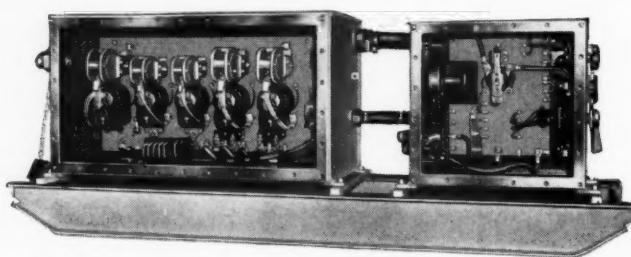
The preliminary work at Indio Muerto properties has been confined to a limited but intensified amount of drilling—33 holes for an aggregate drilling of roughly 25,000 ft. It was done on only a small part of the mineralized district known as the Turquoise Gulch area. So far about 78,000,000 tons of copper-bearing ore have been blocked out containing about 1.6 percent copper.

Estimates place Potrerillos ore reserves as probably sufficient to last only four or five years more. It is especially significant that the Indio Muerto project will be coming into production about the same time the Potrerillos mine exhausts its ore reserves. Production for the new property will be more than double the 45,000 tons of copper a year that have been coming from Potrerillos.

Plans call for the construction of an 18-mile railroad from the Turquoise Gulch mine to an ore-crushing plant in the Pastos Cerrados Canyon below Potrerillos, and a four-mile mine conveyor belt system to deliver the finely crushed ore to the main reduction works at Potrerillos. Also planned is the construction of a town near the mine site, and the modernization of the dwellings at Potrerillos, along with new community buildings.

The company believes that the recovery of molybdenum from the copper ores is expected to grow increasingly important, and will shortly seek approval for the installation of plant and equipment at Chuquicamata to extract the molybdenum. The ores at Indio Muerto contain molybdenum in larger quantities than found in the Chuquicamata ores.

Anaconda recently received approval from Chile's president for expenditure of \$36,900,000 to increase Chuquicamata's production of copper by 50,000 tons a year, to be attained by the end of this year. Chuquicamata currently is turning out copper at the annual rate of 250,000 tons.



Photograph illustrates 50/25 H.P. Bulletin 5392 Type ADJR Starter—reversing—230 V C.C. for two-speed motor operation. Bureau of Mines explosion tested enclosure. Four points acceleration. Skid mounted.

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Strike Damage Light

State mine inspector George McDowell reports that north Idaho mines were damaged little by the recently concluded five-month strike, one of the longest and costliest in Idaho history.

Only minor repairs were needed on most of the properties located in the Coeur d'Alene mining district.

McDowell and deputy mine inspector Ted Bush examined the mines immediately following the settlement of the strike.

Vitro Expansion

According to an announcement by J. Carlton Ward, Jr., president, Vitro Corp. of America has acquired Uranium Prospectors Co., Ltd., of Grand Junction, Colo., which will become a wholly-owned subsidiary of Vitro.

Uranium Prospectors Co. has been mining a carnotite type of uranium ore near Green River, Colo., where the company has large reserves. It is expected that about 1500 tons per month of such ore will be milled and processed at the Vitro's Salt Lake City mill.

Vitro paid \$50,000 in cash and additional ore payments for Uranium Prospectors, acquiring all of its outstanding stock, rights and bonds.

"Acquisition of Uranium Prospectors is significant for Vitro's operations on the Colorado Plateau," stated Ward. "We are acquiring substantial ore properties and are assuring the Salt Lake City mill of a consistent supply of ore for processing."

The new officers of Uranium Prospectors are William B. Hall, president; Richard C. Cole, vice-president, and Harold D. Haight, secretary and treasurer, who become the three directors. They are all executives of Vitro's Uranium Division.

Blast Hole Drilling

(Continued from page 73)

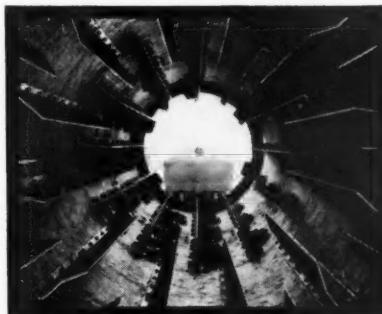
presently helps to account for the excellent penetration rates at Humboldt. In the future higher benches and more frequent multiple row blasts may decrease the amount of broken ground to be drilled, and thereby reduce penetration rates. Another difficulty is the inability to chamber, which possibly will necessitate extra drilled footage and closer hole spacings. Also, the added burden on front row holes because of the drill stem of this rig being located at the center of the machine may possibly add to the necessary footage drilled for any blast. New techniques, however, may help counteract the above mentioned difficulties. For example, the possibility of drilling angle holes with the rotary rig may be of great value in reducing burdens. Certainly the advantages of not requiring water in its operation

during the winter months is of great importance.

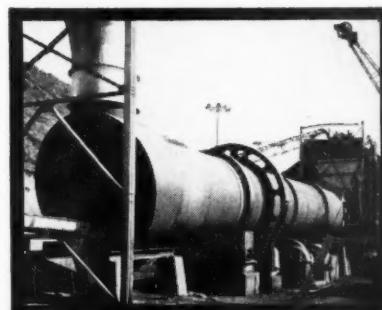
Primary blast hole drilling in the hard iron formations such as at Humboldt is making rapid advances. Although appreciable reductions in the cost per ft of drilling having been realized, the ratio of total drilling costs to total pit costs still remains too high for most taconite and hard jasper operations. It is not unreasonable to surmise that future outstanding modifications to present drilling and blasting practices may alter the present

course of development progress. As a minor example of present experimentation it is interesting to note that patents have been granted this year for procedures to eliminate the irregularity of jet holes so they will be better prepared for the loading of liquid oxygen explosives—certainly a contrasting development compared to the present active work on chambering and free running explosives.

Since the over-all problem is being vigorously attacked by the mining industry, future progress is certain.



Interior of shell of "XH" Ruggles-Coles Dryer showing lifting flights and "knock-out" chains.



10' diameter, 80' long "XH" Ruggles-Coles Dryer drying bauxite.

from
A lumina ores
to
Zircon concentrates

... in the drying of ores and concentrates. That is the story of Ruggles-Coles "XH" Dryers.

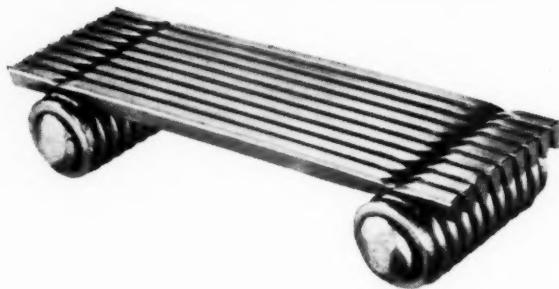
Small or large, each dryer is designed for the specific requirements of the user with the knowledge and experience gained from hundreds of installations.

Complete specifications upon request. Ruggles-Coles Dryers are described in Bulletin AH-438-52

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Wheels of Government

(Continued from page 98)

floor. Most observers expect the Water Pollution Control Act extension to be approved by Congress this Spring.

Minerals Programs Sought

Dissatisfaction over the lack of progress in the development of long-range minerals programs on the part of many members of Congress from mining areas has resulted in the introduction of a rash of bills aimed at stimulating the production of a number of strategic and critical minerals and metals.

Measures calling for new or revised purchase programs for tungsten, manganese, mica, chromite, asbestos, antimony, mercury, beryl and columbium-tantalum have been introduced in both Houses. Several bills have as their objective the establishment of a new domestic tungsten buying program with a goal of an additional 3 million short ton units, to be procured at present program prices over a three-year period ending June 30, 1959. Another measure calls for the Secretary of Interior to present Congress with a plan for keeping the domestic mining industry healthy at all times, and to submit legislative proposals to carry out the plan.

Legislation which would provide for payment of a production bonus to producers of strategic minerals has also been introduced in both Houses by an imposing array of Representatives and Senators. The production payment plan would provide that the Government pay domestic producers of tungsten, manganese, chromite, mica, asbestos, beryl, and columbium-tantalum ores a production bonus equal to the difference between the world market price at any given time and the price which has been prescribed by the Government for each mineral under current purchase programs. This bonus system would go into effect when the Government terminates the purchase programs now in effect. Hearings will be held beginning April 19 by the Senate Interior Committee on this and other mineral program measures.

Meanwhile Senator Malone (Rep., Nev.) has urged the Senate Interior Committee to act promptly on his bill to extend the Domestic Minerals Purchase Program. He said such action is "imperative" due to the fulfillment of the domestic quota of tungsten which is slated in May or June. He pointed out that the President had vetoed a similar bill last year, on the premise that the Government was preparing long-range programs for the minerals industries. He said Congress is bound to provide stop-gap relief for the domestic mining industry pending

the development of the long-range programs.

Congressmen and Senators of both parties are becoming more and more critical of the failure of the Office of Minerals Mobilization to develop programs to establish mobilization bases for the various minerals and metals produced in this country. Officials of the agency, of the Interior Department, and of ODM have been called before Committees of both Houses to explain the lack of programs, and much dissatisfaction has been expressed with the lack of any concrete action in the minerals field. Privately, several members of Congress have indicated that OMM should be abolished and members of the Appropriations Committees have indicated that they are in the mood to eliminate funds from appropriations measures for operation of OMM.

OTC Under Fire

The Administration is striving desperately to secure congressional approval of United States membership in the Organization for Trade Cooperation (OTC) which would administer the General Agreement on Tariffs and Trade (GATT). The White House sent six Cabinet members and the representative of another before the House Ways and Means Committee to extoll the virtues of OTC and to urge its prompt approval.

The House Committee held two and a half weeks of hearings and is now considering the measure. During the hearings heavy opposition to U. S. participation in OTC was registered by a large number of industry spokesmen. In general these witnesses objected to Congress giving up its constitutional control over foreign trade to an international agency. Many of them pointed out that membership in OTC would result in further reductions in tariff rates and a heavy influx of foreign goods produced by cheap labor.

Julian D. Conover, Executive Vice-President, American Mining Congress, registered the organization's strong opposition to OTC. He stated that congressional approval of OTC was tantamount to approving GATT, with all its complex rules for the conduct of international trade—although GATT itself has never been submitted to Congress for consideration.

Conover pointed out that if the United States were to participate in OTC it would have only one vote out of thirty-five, would pay a major share of the cost, and would have neither a veto power nor proportional voting power over policies proposed. He told the Committee that there is grave constitutional doubt whether participation in GATT is a legitimate exercise of the powers delegated to the President under the Trade Agreements Act. He urged careful consideration both of

OTC and GATT. He pointed out that provisions of GATT would limit the ability of our Government to protect essential domestic industries under the "National Security" provision of the Trade Agreement Act, and would seriously hamper any action toward "escape clause" relief for a distressed American industry.

Conover emphasized that should Congress now approve OTC-GATT, the United States, under rules of GATT, would be required to bring about conformity between its own domestic legislation and obligations which it assumes under GATT. He said, "This seems to mean that any laws inconsistent or in conflict with GATT must be amended or repealed." He suggested that Congress carefully consider the question of whether it is ready to abandon the principle of self-determination as applied to our foreign trade and turn it over to an international body, thereby subordinating our own legislative process to the decisions of an organization of thirty-five nations in which we would have only one vote.

Those supporting the measure, including some industrialists and a number of importers, took the position that membership in OTC would be beneficial to the Nation and would demonstrate to friendly countries a solid front from an economic standpoint. They also argued that participation in the organization would expand foreign trade and build up the standards of living of friendly nations abroad.

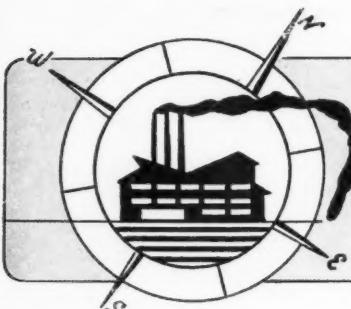
Many Administration supporters in Congress are lukewarm to OTC and a real ding-dong battle is in prospect when the measure reaches the floor for debate. Most observers refuse to go out on a limb and predict approval of the bill. It is expected that it will take all of the persuasiveness of the President, his White House staff, and the Cabinet that can be exerted to secure enactment of the measure.

Gyralory Crusher

A gyratory ball mill, manufactured by General Machinery Co. of Spokane, Wash., will be given its first test outside the laboratory this year at a gold property near Fort Yukon, Alaska. H. I. Gustafson, vice-president of General Machinery, announced recently. The mill was invented by A. W. Fahrenwald, dean emeritus of the University of Idaho School of mines.

The 25-ton mill utilizes the principal of centrifugal force, and the balls, which do the ore crushing, are working all the time.

Toussaint said he does not expect to mine this summer, but will test run his mill and be ready next spring. He will concentrate on underground mining during the winter months.



Manufacturers Forum

Air-Driven Wagon Drills

TWO NEW air-driven wagon drills, featuring fully automatic controls grouped conveniently on a motor which can be re-positioned along the

mast, have recently been announced by The Thor Power Tool Co., Aurora, Ill.

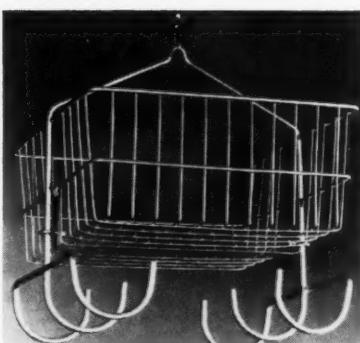
Mounting either a Thor 75 or 77 sinker rock drill or a Thor 82 or 92 drifter, the SW-1 is equipped with a saddle and cone permitting mast adjustment for drilling holes through a full 360° in all directions.

The chassis "collapses," by means of a worm drive, for drilling at various levels.

The BW-2 heavy-duty wagon drill can be used with Thor's Model 82 or 92 drifters as well as with the 105 drifter unit. The new rig incorporates a freshly designed mast with improved chain tension adjustments and advanced shock absorbers. The mast has grouped, movable controls including lever-operated blower control and a motor feed control with variable feed. The chassis has a positive 90° wheel lock for line drilling.

Overhead Clothes Storage

SIMPLE STORAGE of clothes and personal effects in normally wasted space is attributed to a new overhead Lockerbasket. The basket holds shoes,



helmet and personal effects, while the Clothes-Lok action coat hooks lock the employee's clothing to the unit. Complete operating accessories are furnished with each Lockerbasket, including chain, pulleys, pulley supports and locking assembly. For catalogue and complete information write to The Moore Co., 1036 Quarrier St., Charleston, W. Va.

Car Switcher

A RUBBER-TIRED SWITCHER that climbs across tracks, travels on city streets, and pulls freight cars has been announced by LeTourneau-Westinghouse, Peoria, Ill.

Claimed to be equal in power to a 50-ton conventional switch engine, the Switchmobile weighs less than 36,000



lb and measures 10 ft 3 in. wide by 10 ft 8 1/2 in. high by 23 ft 8 1/2 in. long. The all-wheel drive Switchmobile can pull or push in either direction.

Coupling cars to the Switchmobile is standard railroad procedure, as the machine is fitted with standard couplers and air brake lines both front and rear. Compressed air, in addition to being used in the train braking system, is also employed for the machine's steering and braking.

Protect Against Shock

CONTINUOUS GROUND FAULT PROTECTION to off-track equipment using type W (two conductor) cable is provided with a new electrical device just announced by Ensign Electric & Mfg. Co., Huntington, W. Va. Called the "Ground-I-Cator," the unit is designed to meet requirements of U. S. Bureau of Mines Schedule 2F. It comes packaged with cable, hose and extra glands. Complete details are available from the company in Bulletin 3000.

Drum Handling Clamp

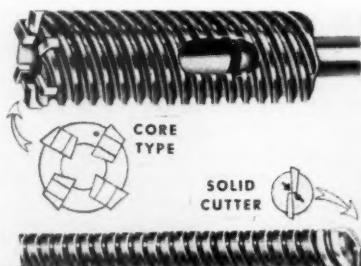
DEVELOPMENT of a rotating drum handling attachment of 2000-lb capacity is announced by the Yale & Towne Mfg. Co., 11000 Roosevelt



Bld., Philadelphia 1, Pa. The company reports the unit can serve a number of drum handling assignments and is particularly effective where quick horizontal placement or stacking is a material's handling requirement.

Power Type Masonry Drills

ADDITION of 11 tungsten carbide-tipped masonry drills to the Proto line has been announced by the Plumb Tool Company, Los Angeles, Calif. According to the manufacturer, they are designed for accurate, high-speed drilling through concrete, brick, marble, granite, stone, tile, plaster, as-



palt, plastics, asbestos, wall-board, glass, reinforcing steel, and steel beams embedded in masonry. The drills are turned by rotary electric and air drills. Six of the drills, for $3/16$ to $1\frac{1}{8}$ -in. holes, are the solid cutter type. The other five drills for $\frac{5}{8}$ to $1\frac{1}{4}$ -in. holes, are the hollow core type.

Electric Starting Systems

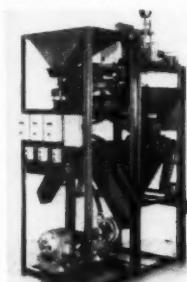
QUICK, EASY STARTING on cold winter mornings is claimed with the direct electric starting systems just announced by Caterpillar Tractor Co. as attachments for D6, D4 and D2 Tractors and No. 977, No. 955 and No. 933 Traxcavators.

Each of the 24-v systems now includes as standard equipment two ether starting aids and the necessary tubing to inject vaporized ether into the air intake manifold.

It is reported that use of the ether starting aids in conjunction with the glow plugs which have been successfully used in Caterpillar direct electric starting systems for some time makes it possible to start without difficulty in temperatures as low as 10° F.

HM Batch Testing

A LABORATORY-SIZE heavy-media separatory vessel is being introduced by The Ore & Chemical Corp., 80 Broad St., New York, N. Y. The Unit is furnished complete in steel framework and is designed for



batch-type testing. The company reports it can handle all feeds to which Heavy Media separation is commercially applicable in size ranges from minus one in. to plus 10 mesh.

Although designed specifically for laboratory use, it is said the vessel offers the same simplicity and high ratio of productive pool area as are claimed for the commercial "OCC" Heavy Media vessel recently introduced by the company. Types for batch testing with feed capacities up to 1000 lb per hr are available.

Abrasive Cleaning Tool

CLEANING WITH ABRASIVES is reportedly made easier with the Clemco Educt-O-Matic self-contained cleaning tool. It weighs 11 lb, including abrasive, and provides for recovery of the abrasive and dust. The cyclone removes the dust into an attached bay and allows the abrasive to re-enter the hopper for re-use. The Educt-O-Matic operates on 33 to 60 cfm air supply and a single $\frac{1}{2}$ -in. air line is the connection required.

The tool is manufactured by Clementina, Ltd., 2277 Jerrold Ave., San Francisco, Calif.

Air and Water Hose

A NEW, HIGH VISIBILITY hose of braided wire construction for extra safety at pressures to 2000 psi has

been announced by Manhattan Rubber Division, Raybestos - Manhattan, Inc., Passaic, N. J. It is built with special steel braids that offer maximum resistance to accidental crushing in mine and quarry service, the company reports. In addition, a neoprene tube that withstands hot oil from compressors, and a bright yellow cut-resistant cover to provide maximum visibility and hose life are used in the hose. It is sold under the names Super-Master BW Air and Super-Master BW Water.

Shock Protection

GROUND FAULT PROTECTION of mobile off-track mining equipment which may become alive through failure of insulation provided by the Ground Sentinel, a new development of National Mine Service Co., Beckley, W. Va.

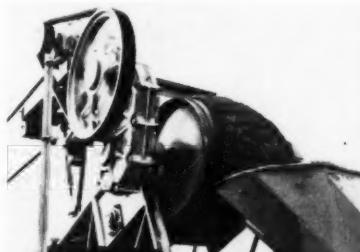
Mounted on the individual machines, the Ground Sentinel is in effect continuous resistance monitor. It continuously measures resistance of the insulation while the machine is in operation. In the event resistance level falls below a predetermined value, the Ground Sentinel disconnects control and headlight power, shutting down the machine.

The Ground Sentinel is a self-contained unit housed in a cast steel, explosion-proof compartment. Electrical components consist of: ground fault relay, control circuit relay, two selenium rectifiers to act as voltage check valves, a reset switch, and a test switch in series with which is connected a resistor and a Thermistor.

Additional details on the Ground Sentinel may be obtained from National Mine Service Co.

Torque-Arm Speed Reducers

WITH THE RECENT ADDITION of two models to its Torque-Arm line, Dodge Mfg. Corp. of Mishawaka,



Ind. now offers shaft-mounted speed reducers with capacities from one to 60 hp and output speeds from 12 to 365 rpm. The reducers are mounted directly on the shaft, and the Torque-Arm is fastened to any fixed object, anchoring the reducers. The unit is driven through a V-belt drive. Write the company for Dodge Bulletin A-637.

Mobile Mike

A TRANSISTORIZED dynamic microphone for mobile radio applications has been announced by Motorola. The microphone features a dynamic element employed in conjunction with a built-in transistor preamplifier. The preamplifier boosts the dynamic output to conventional transmitter input level. This technique overcomes the noise pickup problem. The amplifier draws its power from the conventional "talking current" supply and is directly interchangeable with Motorola carbon microphones now in use.

Additional information is available from Motorola Communications and Electronics Inc., 4501 W. Augusta Blvd., Chicago 51, Ill.

— Announcements —

The 27 companies throughout the world which comprise the Atlas Diesel organization have officially adopted a common name to replace the widely varied company titles. Henceforth each will be known as Atlas Copco — (usually the country in which it is headquartered). The two companies of the group in the United States are Atlas Copco Pacific, Inc., and Atlas Copco Eastern, Inc.

Ohio Brass Co. announces the appointment of E. C. Thompson as general factory manager in Mansfield. Thompson was formerly district manager for the Texas territory with headquarters at Dallas. Succeeding him in this office is T. J. Harris who, for the past nine years, has been a district manager at Chicago. H. A. Blocki, of the Mansfield home office, will fill the Chicago position vacated by Harris.

General Anthony C. McAuliffe will join American Cyanamid Co. on May 1. He will head the newly-created Engineering and Construction Division which will have coordinate status with that of the Operating and Research Divisions of the company; and, in that capacity, he will be president of its engineering subsidiary, Chemical Construction Corp.

Marion Power Shovel Co., Marion, Ohio, has transferred several of its sales representatives.

Walter Pierson, formerly southeastern area sales manager, has been transferred to the Marion home office to assume the duties of assistant to L. C. Mosley, manager of the company's mining division.

Hugh Lewis replaces Pierson as southeastern area sales manager. William Garrison, divisional sales manager, will assist Lewis. He was transferred from a similar position which he had held in the company's area sales office at New York City.

SEE NEXT PAGE FOR CATALOGS — BULLETINS.

CATALOGS & BULLETINS

A-C SCALPING SCREENS. *Allis-Chalmers Manufacturing Co., 972 S. 70th St., Milwaukee, Wis.* Bulletin 07BS368 describes the company's run-of-mine vibrating screen capable of handling pieces of ore weighing up to four tons.

CENTRALIZED LUBRICATION. *The Farval Corp., 3249 East 80th St., Cleveland 4, Ohio.* "Studies in Centralized Lubrication 1955" presents a few case studies in the use of centralized lubrication in various industries.

IN-LINE HELICAL GEAR DRIVES. *Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.* Book 2651 describes the company's new line of in-line helical gear drives. Load classes for over 250 appli-

cations, overhung load ratings and dimension tables, instructions for proper selection and cutaway views of both double and triple reduction gears are given.

JET-LUBE LUBRICANTS AND GREASES. *Jet-Lube, Inc., 3039 N. California St., Burbank, Calif.* Catalog contains technical information, specifications and uses of Jet-Lube multi-purpose greases, outside gear and track roller lubricants, "MX" gear oils with moly-disulfide, chain and gear oil, Kopr-Kote anti-seize compound, thick-or-thin sealing compound and Moly-Spray air-dry lubricant.

PUMPS. *C. H. Wheeler Mfg. Co., 19th St. & Lehigh Ave., Philadelphia 32, Pa.* Catalog A-155 describes Wheeler-Economy Type M Pumps for medium and high head service. Cross sections of design are shown for bottom suction and side suction types. Construction details are included.

PUMP MAINTENANCE HINTS. *Morris Machine Works, Baldwinsville, N. Y.* Helpful hints on maintenance of initial pump efficiency and choosing a dredge pump to best serve a particular need are discussed in bulletin No. 184-A. The bulletin also outlines 24 models in the company's line of "GA" and "GAF" dredge pumps which range from 6 to 20 in. in size.

SPLICING AND FITTING WIRE ROPE. *E. H. Edwards Co., Butler Road and Industrial Way, South San Francisco, Calif.* This brochure gives detailed information on splicing and fitting wire rope, including sections on making a tuck, breaking down a strand, marine eye splice, blocking and serving, loggers eye splice, rolled-in eye splice, and endless splice. Step by step photographs and drawings illustrate correct methods of splicing and fitting.

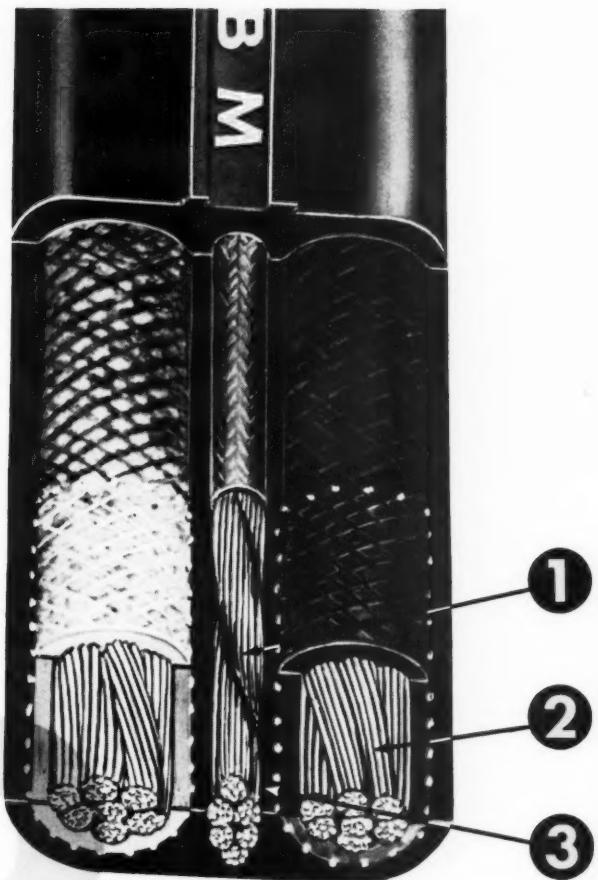
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- 1 Set of 15 Wood Splints
- 1 Pair 4" bandage Scissors
- 2 Army-Type Tourniquets
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- 12 2" Compress Bandages, unsterilized
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- 4 Wood Blocks for heat applications
- 6 U. S. Bureau of Mines First Aid Manuals
- 2 Padlocks
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